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The SIXTY-FOURTH
ANNUAL REPORT
of the ^{Board} Board of Water
Commissioners of
the City of Detroit

For the Year Ending
June 30th, 1916





President, JAMES J. BRADY



SIXTY-FOURTH ANNUAL REPORT
OF THE
BOARD *of* WATER COMMISSIONERS
OF THE CITY OF DETROIT

TO THE
COMMON COUNCIL *of* THE CITY *of* DETROIT

TOGETHER WITH THE REPORTS OF
THE OFFICERS OF THE BOARD

FOR THE YEAR ENDING
JUNE 30, 1916

DETROIT
THOS. SMITH PRESS
1917

BOARD of WATER COMMISSIONERS of THE CITY OF DETROIT

MEMBERS

JAMES J. BRADY, 1917	BENJ. F. GUINEY, 1919
ROBERT OAKMAN, 1918	EMIL STROH, 1920
ALEX. DOW, 1921	

COMMITTEES

WAYS AND MEANS.....	Commissioners OAKMAN and STROH
EXTENSION AND CONSTRUCTION {	Commissioners STROH and OAKMAN
WATER WORKS PARK.....	Commissioners DOW and GUINEY
SUPPLIES.....	Commissioners GUINEY and DOW

The President is ex-officio member of each committee.

OFFICERS

PRESIDENT.....	JAMES J. BRADY
VICE-PRESIDENT.....	ROBERT OAKMAN
SECRETARY.....	H. A. GILMARTIN
GENERAL SUPERINTENDENT.....	THEODORE A. LEISEN
PURCHASING AGENT AND PAYMASTER.....	H. S. STARKEY
AUDITOR.....	J. W. LOEFFLER
CHIEF ENGINEER AT PUMPING STATION.....	HARRY W. GOULD
BOOKKEEPER	GEORGE BARRIE
CASHIER.....	D. C. GROBBEL
PERMIT CLERK.....	LOUIS MONTGOMERY
CHIEF CLERK, RATE DEPARTMENT.....	WALTER C. BOWEN
CHIEF CLERK, METER DEPARTMENT.....	CHAS. F. GILMER

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 844. 845. 846. 847. 848. 849. 850. 851. 852. 853. 854. 855. 856. 857. 858. 859. 860. 861. 862. 863. 864. 865. 866. 867. 868. 869. 870. 871. 872. 873. 874. 875. 876. 877. 878. 879. 880. 881. 882. 883. 884. 885. 886. 887. 888. 889. 890. 891. 892. 893. 894. 895. 896. 897. 898. 899. 900. 901. 902. 903. 904. 905. 906. 907. 908. 909. 910. 911. 912. 913. 914. 915. 916. 917. 918. 919. 920. 921. 922. 923. 924. 925. 926. 927. 928. 929. 930. 931. 932. 933. 934. 935. 936. 937. 938. 939. 940. 941. 942. 943. 944. 945. 946. 947. 948. 949. 950. 951. 952. 953. 954. 955. 956. 957. 958. 959. 960. 961. 962. 963. 964. 965. 966. 967. 968. 969. 970. 971. 972. 973. 974. 975. 976. 977. 978. 979. 980. 981. 982. 983. 984. 985. 986. 987. 988. 989. 990. 991. 992. 993. 994. 995. 996. 997. 998. 999. 1000.

BOARD of WATER COMMISSIONERS of THE CITY OF DETROIT

From July 1st, 1909

METER RATES

Payable Quarterly

Quarterly

| | |
|---|-----------------------|
| First 2,000 cubic feet per quarter, minimum charge. | 90 cts. |
| Next 2,000 cubic feet..... | 44 88/100 cts. per M. |
| All additional | 22 44/100 cts. per M. |
| Double rates outside of city. | |
| Minimum rate for terraces and apartments— | |
| First | 90 cts. |
| Each additional | 45 cts. |

ASSESSMENT RATES

Per Annum

| | |
|--|------------------|
| For family, household purposes, each family..... | \$3 00 |
| Private stable, for each horse..... | 1 20 |
| Livery stable, for each horse..... | 1 20 |
| Dray and team horses, each..... | 1 00 |
| Cows, each | 1 00 |
| Boarding houses, in addition to family rate, each boarder
or roomer | 40 |
| Estimated quantities of water, each 1,000 gallons..... | 07 |
| Automobiles, each | 1 20 |
| Bath tub, for families, each..... | 1 00 |
| " public, each tub | 4 00 |
| Automatic water closets, for family, 1st closet..... | 1 60 |
| " " each additional | 60 |
| Rod water closets, not less than..... | 6 00 |
| Urinals, not less than..... | 2 00 |
| Wash hand basin, for family, each..... | 50 |
| " " for other purposes, each person..... | 15 |
| Hose bibb or connection, premises 30 feet front or less.. | 1 00 |
| " " 30 feet to 60 feet.... | 1 40 |
| " " 60 feet to 100 feet.... | 2 00 |
| Special rates for larger grounds. | |
| Fountains | \$10 00 to 20 00 |
| Street sprinklers, each wagon..... | 50 00 |

WATER RATES

for

BUILDING and CONSTRUCTION PURPOSES

| | |
|-------------------------|-------------------------|
| Brick | 5c per M. |
| Plaster | 7c per 100 Sq. Yds. |
| Concrete | \$1.00 per 100 Cu. Yds. |
| " 6" thick or less..... | 20c per 100 Sq. Yds. |
| Tile | 5c per 100 Cu. Ft. |
| Each perch stone | 1c |

| | No
Basement | Complete
Basement |
|------------------------|----------------|----------------------|
| One story frame | \$ 50 | \$ 75 |
| Two story frame | 75 | 1 00 |
| One story brick | 75 | 1 00 |
| Two story brick | 1 00 | 1 25 |
| Two family frame | 1 00 | 1 50 |
| Two family brick | 1 50 | 2 00 |

Where there is a waste of water an increase of rates will be made.

ANNUAL REPORT *of*
THE BOARD *of* WATER COMMISSIONERS
***of* THE CITY OF DETROIT**

July 1, 1915, to June 30, 1916

TO THE HONORABLE

The Common Council of the City of Detroit.

Gentlemen:—

The Board of Water Commissioners of the City of Detroit respectfully presents its annual report for the fiscal year ending June 30, 1916.

The total receipts for the year were \$1,744,905.40, and the total disbursements were \$1,769,572.26. The total pumpage for the year was 46,688,949,000 gallons, an increase of 4.7% over that of the previous year. The average daily consumption of water was 127,565,434 gallons, equal to a daily per capita consumption of 163 gallons, based on a population of 781,133.

During the year 49.18 miles of new water mains were completed, including one forty-eight and one forty-two inch supply mains. The work of metering all service connections has been going forward steadily during the year, and on June 30, 1916, there were 46,991 meters in service.

Respectfully submitted,

JAMES J. BRADY,
ROBERT OAKMAN,
BENJ. F. GUINEY,
EMIL STROH,
ALEX. DOW,

Commissioners.

H. A. GILMARTIN,
Secretary.

FINANCIAL STATEMENT

July 1, 1915—

| | | |
|--|-----------------------|-------------------|
| Cash on hand..... | \$ | 9,887.65 |
| Cash in bank— | | |
| General Fund | \$279,889.50 | |
| Sinking Fund | 94,284.36 | |
| Secretary Fund | 1,000.00 | |
| Hurlbut Fund | 830.04 | |
| | <u>\$</u> | <u>376,003.90</u> |
| | | \$ 385,891.55 |
| Receipts for year ending June 30, 1916..... | <u>\$1,744,905.40</u> | |
| | | \$2,130,796.95 |
| Disbursements for year ending June 30, 1916..... | <u>\$1,769,572.26</u> | |

Balance—

| | | |
|--------------------------|---------------------|----------------------|
| Cash on hand..... | \$ | 5,076.34 |
| Cash in bank— | | |
| General Fund | \$292,953.60 | |
| Outstanding checks | 39,457.65 | |
| | <u>\$253,495.95</u> | |
| Sinking Fund | 100,115.58 | |
| Hurlbut Fund | 1,536.82 | |
| Secretary Fund | 923.00 | |
| Outstanding checks | 127.35 | |
| | <u>\$</u> | <u>795.65</u> |
| Cash on hand..... | 204.35 | |
| | <u>\$</u> | <u>1,000.00</u> |
| | | <u>\$ 361,224.69</u> |

FIRST AND OLD DETROIT NATIONAL BANK

BOARD OF WATER COMMISSIONERS

Detroit, Michigan.

Gentlemen:—

This is to certify that the balance standing to your credit on our books at the close of business June 30th, 1916, was:

| | |
|----------------------|---------------------|
| General Fund | \$292,953.60 |
| Secretary Fund | 923.00 |
| Hurlbut Fund | 1,536.82 |
| Sinking Fund | 100,115.58 |
| Total | <u>\$395,529.00</u> |

Yours very truly,

JAMES A. WILSON,
Assistant Cashier.

Cost of Water Service Operations for the Year Ending June 30th, 1916

Pumped per Meters at Pumping Station, 46,688,448,000 gals.

PRODUCTION COST

| | | | |
|--|-------------|--------------|---------|
| Collection and Purification Cost: | | | |
| Operation of intake system..... | \$ 706.43 | | |
| Chemical treatment..... | 16,593.98 | | |
| Maintenance of collection and purification plant..... | 25,320.68 | | |
| Depreciation of collection and purification plant..... | 7,834.20 | | |
| Direct cost of collection and purification plant..... | | \$ 50,450.29 | \$ 1.08 |
| Steam Power Cost: | | | |
| Fuel for pumping..... | \$61,417.38 | | |
| Wages for firemen and helpers..... | 27,829.90 | | |
| Boiler house supplies..... | 13.43 | | |
| Maintenance of steam power plant and buildings..... | 2,470.90 | | |
| Depreciation of steam power plant and buildings..... | 8,068.44 | | |
| Direct steam power cost..... | | 99,800.14 | 2.13 |
| Cost of Operating Pumps: | | | |
| Wages of assistant engineers and helpers..... | \$37,159.13 | | |
| Oils, waste and supplies..... | 3,424.56 | | |
| Maintenance of pumping plant and buildings..... | 1,453.00 | | |
| Depreciation of pumping plant and buildings..... | 28,416.32 | | |
| Direct cost of operating pumps..... | | 70,453.01 | 1.51 |
| Superintendence and general expense..... | | 3,843.83 | .08 |
| Proportion of Overhead Expense: | | | |
| Proportion of engineering department expense..... | \$ 6,199.86 | | |
| Proportion of administration and general expense..... | 496.01 | | |
| Total proportion of overhead expense..... | | 6,696.47 | .14 |
| Total cost of water delivered to mains..... | | \$231,273.74 | \$ 4.95 |

DISTRIBUTION COST

| | | | |
|---|-------------|--------------|---------|
| Distribution System Cost: | | | |
| Repairing main leaks..... | \$ 5,140.14 | | |
| Repair and maintain gates and wells..... | 8,152.48 | | |
| Flush mains and blow off dead ends..... | 2,348.88 | | |
| Repair trenches, walks and lawns..... | 1,487.89 | | |
| Depreciation of water mains, gates and wells..... | 96,818.12 | | |
| Depreciation of emergency station..... | 206.80 | | |
| Direct distribution costs..... | | \$114,157.31 | \$ 2.45 |

| | | | |
|---|--------------|--|---------|
| Service Costs: | | | |
| Repair service leaks..... | \$ 1,447.86 | | |
| Repair and maintain drinking fountains..... | 1,256.01 | | |
| False reports of leaks..... | 176.50 | | |
| No water and short supply..... | 710.81 | | |
| Shut off and let on..... | 265.70 | | |
| Miscellaneous inspection expense..... | 2,138.12 | | .13 |
| Total direct distribution cost..... | 5,995.00 | | |
| Total direct distribution cost..... | \$120,152.31 | | \$ 2.58 |
| Proportion of overhead expense: | | | |
| Proportion of general yard expense..... | \$16,110.57 | | |
| Proportion of engineering expense..... | 6,204.17 | | |
| Proportion of administration and general expense..... | 53,597.28 | | 1.62 |
| Total proportion of overhead expense..... | 75,918.02 | | |
| Total distribution costs..... | \$196,070.33 | | \$ 4.20 |
| METER SERVICE COSTS | | | |
| Meter Department Costs: | | | |
| Repair and maintain meters..... | \$ 8,333.12 | | |
| Remove and replace meters..... | 2,198.20 | | |
| Depreciation of meters..... | 5,414.08 | | |
| Direct meter cost..... | \$ 15,945.49 | | .34 |
| Proportion of Overhead Expense: | | | |
| Proportion of storage yard expense..... | \$ 3,204.84 | | |
| Proportion of administration and general expense..... | 37,080.19 | | .86 |
| Total proportion of overhead expense..... | 40,354.03 | | |
| Total proportion of overhead expense..... | \$ 56,200.52 | | \$ 1.20 |
| SUMMARY | | | |
| Total cost of water delivered to mains..... | \$231,273.74 | | \$ 4.95 |
| Total distribution cost..... | 196,070.33 | | 4.20 |
| Total cost of water pumped and delivered..... | \$427,344.07 | | \$ 9.15 |
| Total meter cost..... | 56,200.52 | | 1.20 |
| Total cost..... | \$483,643.59 | | \$10.35 |

CONSTRUCTION REPORT

Year Ending June 30th, 1916

| | |
|---|-----------------------|
| Work in process July 1, 1915..... | \$ 406,850.53 |
| Pay Roll | \$ 349,228.08 |
| Materials | 609,617.25 |
| Cartage | 12,476.93 |
| | <u>\$ 971,322.26</u> |
| Overhead expense— | |
| Storage yard expense..... | 37,488.69 |
| Engineering Dept. Expense..... | 24,451.77 |
| Administration and general expense..... | 8,673.31 |
| | <u>\$ 70,613.77</u> |
| Extending meter service— | |
| Labor and materials..... | \$ 105,028.71 |
| Overhead expense— | |
| Storage yard expense..... | \$ 4,990.60 |
| Administration and general expense..... | 4,341.42 |
| | <u>114,360.73</u> |
| | <u>\$1,563,147.29</u> |
| Completed Work Transferred to Plant Accounts— | |
| Water mains, gate and wells..... | \$ 905,906.33 |
| Collection and purification plant..... | 687.24 |
| Steam power plant..... | 740.95 |
| Pumping plant, No. 2..... | 5,901.37 |
| Water works park improvements..... | 9,474.26 |
| Meters in service..... | 114,360.73 |
| | <u>\$1,037,070.88</u> |
| Maintenance collection and purification system... | \$ 19,885.76 |
| Maintenance buildings, fences and equipment, | |
| Water Works Park..... | 1,417.52 |
| | <u>\$1,058,374.16</u> |
| Work in process June 30, 1916..... | \$ 504,773.13 |

NET REVENUES**Year Ending June 30th, 1916****Water Service Operations—**

| | |
|--|---------------|
| Assessment rates | \$ 615,034.31 |
| Meter rates | 784,126.45 |
| Shutting off and letting on..... | 469.91 |
| Percentage on delinquent accounts..... | 8,135.80 |

| | |
|---------------------------------------|----------------|
| Total revenue from water service..... | \$1,407,766.47 |
| Cost of water service operations..... | 483,643.59 |

Net gain from water service operations.....\$ 924,122.88

Miscellaneous Revenues—

| | |
|--------------------------------------|---------------|
| Estimates paid for pipe lines..... | \$ 112,555.62 |
| Sales of work and material..... | 3,693.63 |
| Bonuses paid for pipe lines..... | 6,912.50 |
| Meter bonuses | 5,878.20 |
| Service extensions | 24.90 |
| Miscellaneous | 3,606.94 |
| Interest earned on general fund..... | 10,213.67 |
| Interest earned on sinking fund..... | 3,553.72 |
| Plumbers licenses | 1,067.50 |
| Service connections | 8,988.35 |

| | |
|---------------------------------------|---------------|
| | \$ 156,495.03 |
| City of Detroit general tax levy..... | \$ 75,000.00 |
| Interest on bonded indebtedness..... | 72,845.00 |

| | |
|---|-------------|
| | \$ 2,155.00 |
| Income from the trustees of the Hurlbut fund..... | \$ 4,852.18 |

| | |
|-------------------------------|----------------|
| | \$1,087,625.09 |
| Water Works Park expense..... | \$ 24,823.19 |

Net gain for year ending June 30, 1916.....\$1,062,801.90

BALANCE SHEET**Year Ending June 30th, 1916****ASSETS.**

| | |
|--|-----------------|
| Current Cash and Bank Accounts: | |
| Current cash | \$ 5,076.34 |
| Cash in Bank: | |
| General Fund | 253,495.95 |
| Hurlbut Fund | 1,536.82 |
| Secretary's Fund, bank balance and cash on hand... | 1,000.00 |
| Total cash and bank accounts | \$ 261,109.11 |
| Accounts Receivable: | |
| Meter rates | \$ 81,982.33 |
| Assessment rates | 3,149.30 |
| Miscellaneous accounts receivable | 7,030.42 |
| Total accounts receivable.. | \$ 92,162.11 |
| Inventories: | |
| Stores and supplies at yard... | \$ 166,952.33 |
| Coal at pumping station..... | 19,488.85 |
| Construction work in process. | 504,773.13 |
| Equipment | 109,556.74 |
| Total inventories | \$ 800,771.05 |
| Plants: | |
| Collection and purification plant | \$ 554,741.72 |
| Steam power plant..... | 297,499.95 |
| Pumping plant No. 1..... | 1,016,705.23 |
| Pumping plant No. 2..... | 1,001,036.13 |
| Water mains, gate and wells. | 11,540,497.30 |
| Meters in service..... | 446,757.34 |
| Public drinking fountains.... | 8,981.45 |
| Storage yards buildings and improvements | 84,759.38 |
| Emergency station | 15,723.91 |
| Main office building..... | 54,288.00 |
| Water Works Park improvements | 153,344.12 |
| Proposed filtration plant..... | 426.16 |
| | \$15,174,760.00 |
| Less reserve for depreciation... | 2,315,046.50 |
| Present value of plants... | \$12,859,714.19 |
| Real estate | 863,128.43 |
| Sinking Fund | 100,115.58 |
| Total | \$14,977,000.47 |

LIABILITIES, ETC.

| | |
|---|-----------------|
| Current Liabilities: | |
| Vouchers payable | \$ 83,052.53 |
| Interest accrued on bonds.... | 23,010.97 |
| 1915-16 assessment | 18,821.36 |
| Accrued payroll, storage yard | 469.83 |
| Total current liabilities... | \$ 125,354.69 |
| Special Liabilities: | |
| Liabilities to injured workmen | \$ 3,197.62 |
| Bonded Indebtedness: Total liabilities | |
| | \$ 1,947,000.00 |
| Reserve: | |
| Sinking Fund | \$ 100,115.58 |
| Hurlbut Fund | 1,536.82 |
| Total reserve | \$ 101,652.40 |
| Surplus | \$12,799,795.76 |

\$14,977,000.47

BONDED INDEBTEDNESS

The following table shows the dates of issue and amount of bonds of this department outstanding at this date. The total amount issued by the Board during its existence is \$3,990,000, of which \$300,000 were refunded and \$1,743,000 redeemed, leaving a balance due of \$1,947,000.

| Act | | | | | Rate of
Int. | Redeemed
Refund | Out-
standing |
|------|-------|----------|-------|----------|-------------------|--------------------|-------------------|
| 1873 | Jan. | 10, 1895 | Jan. | 10, 1925 | \$ 100,000 | 4% | \$ 100,000 |
| 1869 | Feb. | 1, 1900 | Feb. | 1, 1930 | 200,000 | 3½% | \$ 20,000 180,000 |
| 1873 | Jan. | 1, 1903 | Jan. | 1, 1933 | 50,000 | 3½% | 50,000 |
| 1873 | Sept. | 1, 1903 | Sept. | 1, 1933 | 150,000 | 3½% | 150,000 |
| 1901 | June | 1, 1904 | June | 1, 1934 | 200,000 | 3½% | 200,000 |
| 1901 | Aug. | 1, 1904 | Aug. | 1, 1919 | 100,000 | 4% | 100,000 |
| 1901 | Feb. | 1, 1905 | Feb. | 1, 1935 | 150,000 | 3½% | 150,000 |
| 1901 | Aug. | 1, 1908 | Aug. | 1, 1938 | 250,000 | 3½% | 75,000 175,000 |
| 1901 | July | 1, 1909 | July | 1, 1939 | 200,000 | 3½% | 98,000 102,000 |
| 1901 | Oct. | 1, 1912 | Oct. | 1, 1932 | 240,000 | 4% | 240,000 |
| 1913 | Mar. | 1, 1914 | Mar. | 1, 1944 | 500,000 | 4% | 500,000 |
| | | | | | <hr/> \$2,140,000 | <hr/> \$193,000 | <hr/> \$1,947,000 |

REPORT OF THE GENERAL SUPERINTENDENT**TO THE BOARD OF WATER COMMISSIONERS OF
THE CITY OF DETROIT.**

Gentlemen:—I submit herewith the annual report of the Engineering, Construction, and Operating Departments for the fiscal year ending June 30, 1916, giving a general statement of the results accomplished by these branches of the service, and embracing tabulations and other detailed information relative to the pumpage records, and work on the distribution system.

PUMPAGE AND DISTRIBUTION

The statements of water pumped are based on meterage records as registered by the Venturi Meters, and differ from the pumpage quantities calculated by plunger displacement by approximately three per cent, this difference representing the combined amount of pump slippage and unmetered water used at the pumpage station and surrounding grounds.

The total pumpage for the year amounted to 46,688,949,000 gallons, of which 33,820,674,000 gallons represented the low service, and 12,868,275,000 gallons the high service consumption. The pumpage for the current year showed an increase of $4 \frac{7}{10}$ per cent over the previous year's record, as compared with an increase of $3 \frac{7}{10}$ per cent of population served, the low rate of increase in the latter instance being due to the inclusion of Highland Park in the territory served during the previous year, whereas during the full period of the current year it maintained an independent water supply system.

The average daily consumption of water was 127,565,434 gallons, equivalent to a daily per capita consumption of 163 gallons, based on a population of 781,133 for Detroit and the environs supplied by the Detroit system. The exclusion of Highland Park as a factor in the records of consumption and population, creates a condition which makes a comparison between the two years somewhat indeterminate.

The number of meters in service connections was increased from 29,180 in 1915 to 46,991 in 1916, and the total

quantity of water furnished through these meters was 24,632,229,930 gallons or 52.7 per cent. of the total consumption, producing 56.0 per cent. of the revenue derived from the sale of water.

The water consumed for industrial purposes, which represents that used by manufacturing industries, railroads, hotels and other business enterprises, amounted to 16,340,000,000 or 35.0 per cent. of the total consumption. The remaining quantity, amounting to 30,348,949,000 gallons, which may be classified as purely domestic consumption, but which of necessity included all water used for sprinkling and flushing streets, fire protection, and all incidental leakage, is equivalent to a per capita consumption of 106 gallons per day.

The rate of maximum consumption was reached on January 17, 1916, when the pumpage for one hour was at the equivalent rate of 192,854,400 gallons per day or 51 per cent. above the average daily rate. The minimum rate of pumpage occurred on May 27, 1916, with an equivalent daily rate of 72,000,000 gallons.

The reports from the Fire Department during the past year indicate a total consumption of 21,630,000 gallons for fire protection purposes, or one-twentieth of one per cent. of the total quantity pumped. The following tables give the maximum and minimum figures, and other details of pumpage as indicated both by plunger displacement and metered measurement, and a statement of the high and low service pumpage, showing both monthly quantities and daily averages.

COMPARISON OF METER AND PUMP RECORDS

| | Meter
Measurement | Plunger
Displacement |
|--|----------------------|-------------------------|
| Maximum day, June 18, 1916..... | 158,450,000 | 164,087,770 |
| Minimum day, Nov. 21, 1915..... | 98,550,750 | 101,015,940 |
| Average daily (entire system)..... | 127,565,434 | 131,654,068 |
| Average daily (high service)..... | 35,159,221 | 36,285,898 |
| Average daily (low service)..... | 92,406,213 | 95,368,170 |
| Total for year..... | 46,688,949,000 | 48,185,389,000 |
| Maximum hour (entire system), Jan. 17,
1916, 10 A. M. to 11 A. M..... | 8,035,600 | 8,293,100 |
| Maximum hour (high service)..... | 2,032,500 | 2,097,630 |
| Maximum hour (low service)..... | 6,003,100 | 6,195,470 |
| Minimum hour (entire system), May 27,
1916, 3 A. M. to 4 A. M..... | 3,001,250 | 3,097,430 |
| Minimum hour (high service)..... | 1,027,500 | 1,060,426 |
| Minimum hour (low service)..... | 1,973,750 | 2,037,004 |

| | | |
|--|-------------|-------------|
| Rate per day at maximum hour (entire system) | 192,854,400 | 199,034,400 |
| Rate per day at maximum hour (high service) | 48,780,000 | 50,343,120 |
| Rate per day at maximum hour (low service) | 144,074,400 | 148,691,280 |
| Rate per day at minimum hour (entire system) | 72,030,000 | 74,338,320 |
| Rate per day at minimum hour (high service) | 24,660,000 | 25,450,224 |
| Rate per day at minimum hour (low service) | 47,370,000 | 48,888,096 |

PUMPAGE.

Recorded by Venturi Meters

| Month
1915 | HIGH SERVICE | | LOW SERVICE | | TOTAL | |
|---------------|------------------|--------------------------|------------------|--------------------------|------------------|--------------------------|
| | Total
Gallons | Daily Average
Gallons | Total
Gallons | Daily Average
Gallons | Total
Gallons | Daily Average
Gallons |
| July | 1,075,575,000 | 34,695,968 | 2,850,150,500 | 91,940,339 | 3,925,725,500 | 126,636,307 |
| Aug. | 1,080,725,000 | 34,862,097 | 2,861,236,500 | 92,297,952 | 3,941,961,500 | 127,160,049 |
| Sept. | 1,066,720,000 | 35,557,333 | 2,820,937,000 | 94,031,233 | 3,887,657,000 | 129,588,566 |
| Oct. | 1,049,970,000 | 33,870,000 | 2,700,776,250 | 87,121,814 | 3,750,746,250 | 120,991,814 |
| Nov. | 986,330,000 | 32,877,667 | 2,500,116,000 | 83,337,200 | 3,486,446,000 | 116,214,867 |
| Dec. | 1,028,755,000 | 33,185,645 | 2,651,205,000 | 85,522,742 | 3,679,960,000 | 118,708,387 |
| 1916 | | | | | | |
| Jan. | 1,073,335,000 | 34,623,710 | 2,839,719,000 | 91,603,839 | 3,913,054,000 | 126,227,549 |
| Feb. | 1,083,745,000 | 37,370,518 | 2,910,087,500 | 100,347,845 | 3,993,832,500 | 137,718,363 |
| Mar. | 1,143,605,000 | 36,890,484 | 3,062,623,000 | 98,794,290 | 4,206,228,000 | 135,684,774 |
| Apr. | 1,050,197,500 | 35,006,583 | 2,769,300,500 | 92,310,017 | 3,819,498,000 | 127,316,600 |
| May | 1,122,415,000 | 36,206,935 | 2,926,474,000 | 94,402,387 | 4,048,889,000 | 130,600,322 |
| June | 1,106,902,500 | 36,896,750 | 2,928,048,750 | 97,001,625 | 4,034,951,250 | 134,498,375 |
| Year | 12,868,275,000 | 35,190,972 | 33,820,674,000 | 92,374,462 | 46,688,949,000 | 127,565,434 |

The division of the water consumption and population in Detroit and adjacent suburbs is shown in the accompanying tabulation, and it may be noted that the total quantity of water delivered outside of the city was only three and one-half per cent. of the total pumpage.

CONSUMPTION OF WATER IN DETROIT AND VILLAGES

| | Total
Consumption
Gallons | Daily
Average
Gallons | Estimated
Population |
|----------------------------|---------------------------------|-----------------------------|-------------------------|
| Detroit unmetered | 21,756,719,070 | 59,444,587 | |
| Detroit metered | 23,256,418,530 | 63,542,127 | |
| | 45,013,137,600 | 122,986,714 | 734,562 |
| River Rouge, metered | 271,143,000 | 740,828 | 6,000 |
| Ecorse, metered | 70,585,500 | 192,857 | 2,500 |
| Hamtramck, metered | 964,701,000 | 2,635,795 | 25,000 |
| Oakwood, metered | 45,513,800 | 124,355 | 1,271 |

| | | | |
|--|----------------|-------------|---------|
| Grosse Pointe, metered..... | 23,868,100 | 65,213 | 1,800 |
| Greenfield and unmetered sub-
urbs, including St. Clair
Heights, estimated | 300,000,000 | 819,672 | 10,000 |
| Villages, total | 1,675,811,400 | 4,578,720 | 46,571 |
| Detroit, total | 45,013,137,600 | 122,986,714 | 734,562 |
| Total | 46,688,949,000 | 127,565,434 | 781,133 |
| Total, unmetered | 22,056,719,070 | 60,264,259 | |
| Total, metered | 24,632,229,930 | 67,301,175 | |
| Total pumpage | 46,688,949,000 | 127,565,434 | |

The operations at the pumping stations, show an average station duty of 94,200,000 foot-pounds per 100 lbs. of coal burned for all of the pumping engines, with all steam used for heating surrounding buildings, and for operating portable pumps in cleaning the settling basin charged against the station. The actual cost of operating the pumping stations, and the average cost per million gallons is shown in the following table.

Cost of Pumpage

| | Total Cost | Cost per
Million Gallons | Cost per Million
Gallons Raised 100 ft. |
|------------------------|--------------|-----------------------------|--|
| Labor | \$ 68,832.95 | \$1.47 | \$1.21 |
| Fuel | 61,417.38 | 1.32 | 1.00 |
| Oil and supplies | 3,437.99 | .07 | .06 |
| Miscellaneous | 3,923.90 | .08 | .07 |
| Total | \$137,612.22 | \$2.94 | \$2.43 |

QUALITY OF WATER

The quality of the water has been fairly good throughout the year, although considerable difficulty was experienced in January and February, 1916, in the efforts to destroy the colon bacillus by means of sterilization. The river water showed evidence of B. Coli in 1574 out of 3450 samples of 10 cubic centimetres each or 45 per cent., equivalent to an average of 14.40 B. Coli per 100 c. c. The treated water showed the presence of B. Coli in 218 out of 3460 tests of 10 c. c. each or 6 per cent., equivalent to 1.06 B. Coli per 100 c. c. Phelps method. The relatively high average count in the treated water was due to the high contents in January and February, these two months giving 95 in 285 and 80 in 260 samples respectively.

From July 1, 1915, to January 14th, 1916, the water supply

was treated exclusively with calcium hypochlorite, and from the latter date to March 10, 1916, during the period when the liquid chlorine apparatus was being installed, both calcium hypochlorite and chlorine gas were used. From March 10 to the end of the fiscal year chlorine gas was used exclusively, except for four days in June, when owing to shortage of shipment of liquid chlorine, hypo was substituted. The quantity of liquid chlorine used varied from 1.5 to 2.5 pounds per million gallons of water treated, and the average cost of the treatment was approximately 36 cents per million gallons.

Daily bacterial analyses of the River Water, and Treated Water, show the following results:

Average number of Bacteria per c. c.:

Gelatine at 20 deg. . . . River Water, 187.6; Treated Water 14.5

Agar at 37 deg. River Water, 26.3; Treated Water 11.2

Agar at 20 deg. River Water, 187.2; Treated Water 15.1

RIVER WATER—

B. Coli in 1 C. C. sample—positive on 69 days—81 times in 690 tests.

B. Coli in 10 C. C. samples—positive on 283 days—1574 times in 3450 tests.

TREATED WATER—

B. Coli in 1 C. C. sample—positive on 4 days—4 times in 692 tests.

B. Coli in 10 C. C. samples—positive on 72 days—218 times in 3460 tests.

Presumptive tests—July 1, 1915, to February 29, 1916.

Confirmed tests—March 1, 1916, to June 30, 1916.

The accompanying table gives a monthly resumé of the bacterial analyses of the River and treated water. (See tabulation.)

WATER PRESSURE

The general pressure throughout both the low and high service systems has shown a greater uniformity, although a very slight increase on the average as compared with the preceding year. Where recording gauges have been maintained, a very satisfactory degree of stability and uniformity of pressure has been evidenced, indicating an improvement over previous conditions without any material increase in pressure at the Pumping Station. The tabulation of pressures recorded at the various fire engine houses throughout the city gives the information in detail. (See tabulation.)

BACTERIAL ANALYSIS OF DETROIT WATER

Summary of Monthly Averages—July, 1915 - July, 1916

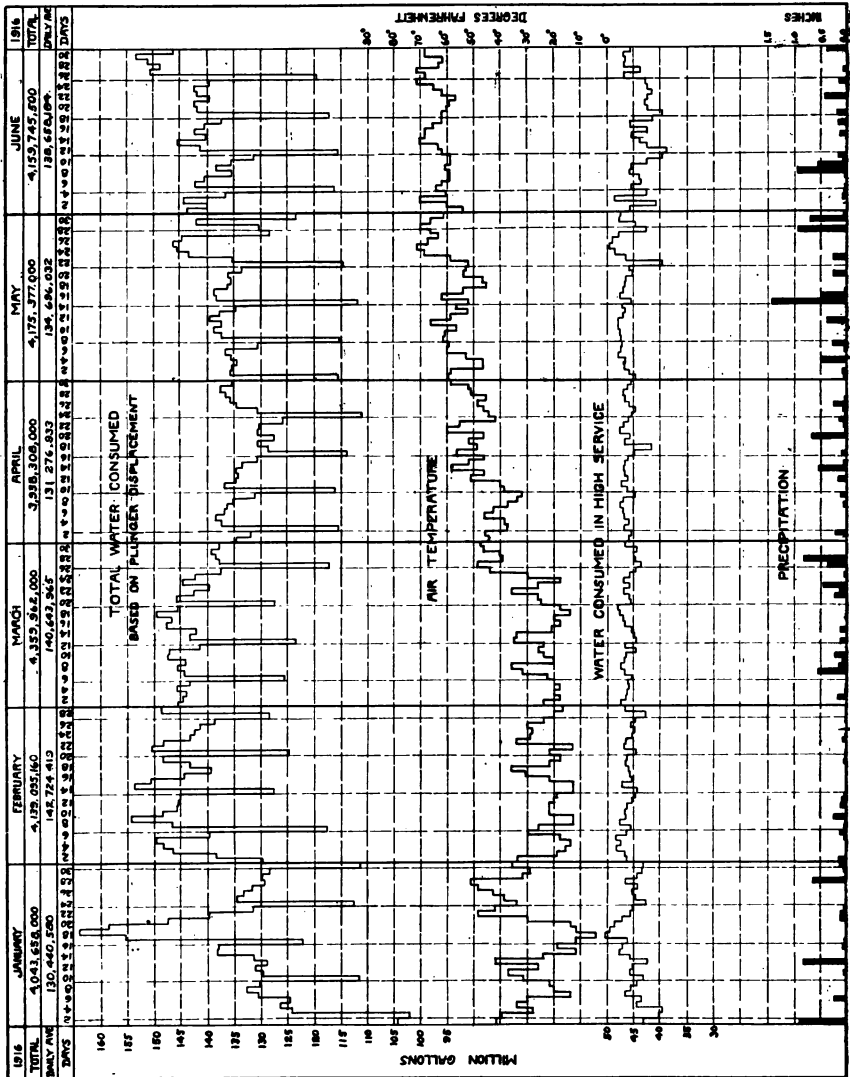
| Month | RAW WATER | | | | | TREATED WATER | | | | | TAP WATER | | | |
|--------------|-------------|-------------|------------------------|-------------------|--------------------|----------------|-------------|-------------|------------------------|-------------------|--------------------|----------------|-------------|-------------|
| | Agar at 20° | Agar at 37° | Gela-
tin
at 20° | B. Coli
1 c.c. | B. Coli
10 c.c. | Tur-
bidity | Agar at 20° | Agar at 37° | Gela-
tin
at 20° | B. Coli
1 c.c. | B. Coli
10 c.c. | Tur-
bidity | Agar at 20° | Agar at 37° |
| July—1915 | 28.8 | 11.7 | 46.2 | 7/71 | 177/355 | 13.7 | 15.5 | 5.9 | 18.6 | 0/71 | 6/355 | .13 | 5.8 | 3.4 |
| August | 41.3 | 21.0 | 57.6 | 9/74 | 270/370 | 18.9 | 5.7 | 4.6 | 5.5 | 0/74 | 0/370 | .00 | 6.2 | 5.0 |
| September | 24.5 | 9.7 | 32.5 | 10/72 | 212/360 | 12.0 | 3.7 | 3.7 | 3.8 | 0/72 | 5/360 | .14 | 3.2 | 2.1 |
| October | 24.7 | 11.7 | 28.6 | 2/63 | 147/315 | 7.3 | 3.4 | 3.2 | 4.0 | 0/63 | 1/315 | .00 | 8.1 | 4.3 |
| November | 116.3 | 21.8 | 116.4 | 2/52 | 83/260 | 7.0 | 14.2 | 5.8 | 16.7 | 0/51 | 7/255 | .28 | 18.2 | 11.8 |
| December | 55.7 | 6.2 | 56.9 | 2/41 | 42/205 | 6.7 | 7.4 | 1.9 | 3.3 | 0/43 | 8/215 | .39 | 3.1 | 1.6 |
| January—1916 | 180.4 | 41.3 | 157.6 | 17/56 | 162/280 | 33.8 | 23.0 | 18.0 | 21.5 | 3/57 | 95/285 | 6.40 | 14.2 | 12.3 |
| February | 178.7 | 50.5 | 87.5 | 16/52 | 150/260 | 34.2 | 15.9 | 20.0 | 7.6 | 1/52 | 80/260 | 4.90 | 13.3 | 24.4 |
| March | 56.5 | 6.4 | 36.3 | 2/54 | 41/270 | 5.0 | 1.7 | 3.7 | 1.4 | 0/54 | 8/270 | .22 | 1.5 | 3.8 |
| April | 137.0 | 88.0 | 1439.0 | 4/51 | 83/255 | 10.4 | 53.0 | 38.0 | 52.0 | 0/51 | 2/255 | .08 | 28.6 | 31.2 |
| May | 93.0 | 25.7 | 106.0 | 7/53 | 87/265 | 13.9 | 13.8 | 15.7 | 16.8 | 0/53 | 3/265 | .11 | 14.9 | 11.6 |
| June | 71.7 | 21.7 | 83.3 | 3/51 | 120/255 | 10.0 | 23.5 | 14.2 | 23.3 | 0/51 | 3/255 | .10 | 41.0 | 21.0 |
| Average | 187.2 | 26.3 | 187.6 | Total
81/690 | Total
1574/3450 | 14.4 | 15.1 | 11.2 | 14.5 | Total
4/692 | Total
218/3490 | 1.06 | 13.2 | 11.0 |
| | | | | | | | | | | | | | | 12.8 |
| | | | | | | | | | | | | | | 2.03 |

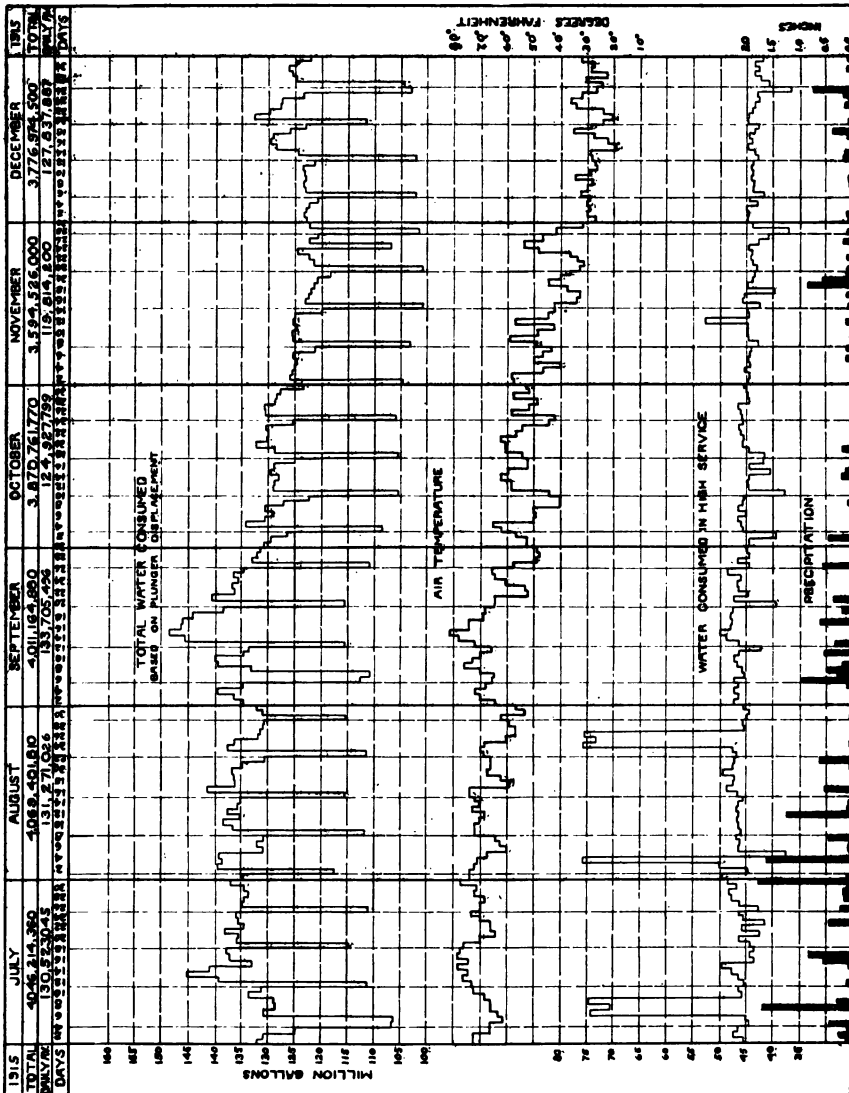
Presumptive tests—July 1-1915 to Feb. 29, 1916.
Confirmed tests —Mar. 1-1916 to June 30, 1916.

Table of Pressures.

| LOCATION OF GAUGES | | | | | | | | | | | | | | | |
|--|---|-------|-------------------------------|----|------|-------|-------------------------------|----|------|-------|---|---------------|-------------------------|---------------|-------|
| Elevat'n
above
City
Datum | Pressure
Corres-
ponding
to diff in
Elevat'n
between
Pump
Wells
and
Engine
Gauges | Feet | July 1, 1915 to June 30, 1916 | | | | July 1, 1915 to June 30, 1916 | | | | Increase
or Decrease
in Friction
During
last Year | Maximum | | Minimum | |
| | | | Average Daily Consumption | | | | Average Daily Consumption | | | | | Hour observed | | Hour observed | |
| | | | 122,162,505 gallons | | | | 127,545,434 gallons | | | | | Jan. 17, 1916 | | May 27, 1916 | |
| | | | Total Consumption for Year | | | | Total Consumption for Year | | | | 8 a. m. to 11 a. m. | | 3 a. m. to 4 a. m. | | |
| | | | 44,589,423,696 gallons | | | | 46,699,949,000 gallons | | | | Daily Rate | | Daily Rate | | |
| | | | 192,854,400 gals. | | | | 192,854,400 gals. | | | | Average Pressure Pounds | | Average Pressure Pounds | | |
| | | | Fric. Loss Pounds | | | | Fric. Loss Pounds | | | | Inc. Dec. | | Fric. Loss Pounds | | |
| | | | Mean | | | | Mean | | | | | | | | |
| | | | High | | Low | | High | | Low | | | | | | |
| Pumping Station | 92.00 | ..... | 68 | 44 | 47.1 | 1.5 | 71 | 20 | 47.5 | 2.7 | 1.2 | 45.7 | 45.7 | 45.7 | 0.8 |
| Engine No. 32, Crane and Brinket | 103.42 | 4.9 | 47 | 33 | 40.7 | 0.4 | 47 | 24 | 38.9 | ..... | ..... | ..... | 35.0 | 32.0 | 32.5 |
| Engine No. 20, Hart and Jefferson | 125.79 | 14.6 | 38 | 26 | 32.1 | ..... | 38 | 18 | 33.3 | ..... | ..... | ..... | 29.0 | 31.0 | 1.5 |
| Engine No. 7, Concord, near Jefferson | 124.77 | 13.2 | 38 | 25 | 31.2 | ..... | 37 | 15 | 31.5 | ..... | ..... | ..... | 28.5 | 30.0 | 3.1 |
| Engine No. 19, Hastings, near Congress | 122.47 | 12.6 | 37 | 25 | 30.8 | ..... | 35 | 15 | 29.5 | ..... | 0.1 | ..... | 25.5 | 28.0 | 3.1 |
| Water Office, Randolph and Jefferson | 120.98 | 14.4 | 36 | 18 | 26.1 | ..... | 34 | 15 | 27.3 | ..... | 0.6 | ..... | 24.0 | 26.0 | 2.3 |
| Engine No. 3, Griswold and Clifford | 125.18 | 13.4 | 32 | 19 | 25.6 | ..... | 33 | 10 | 27.3 | ..... | 0.8 | ..... | 25.0 | 30.0 | 3.3 |
| Engine No. 8, Griswold and Baker | 123.06 | 13.1 | 34 | 20 | 28.3 | ..... | 36 | 14 | 28.9 | ..... | 0.4 | ..... | 26.0 | 30.0 | 2.6 |
| Engine No. 4, Eighteenth, near Howard | 122.14 | 10.5 | 35 | 20 | 29.4 | ..... | 38 | 14 | 28.9 | ..... | 0.9 | ..... | 27.5 | 30.5 | 4.7 |
| Engine No. 10, Sixteenth and Baggs | 116.18 | 9.8 | 35 | 17 | 26.8 | ..... | 34 | 12 | 28.0 | ..... | 0.7 | ..... | 26.0 | 29.0 | 2.3 |
| Engine No. 14, Hubbard near Fort | 125.28 | 14.4 | 37 | 20 | 30.1 | ..... | 38 | 17 | 31.8 | ..... | 1.3 | ..... | 28.0 | 32.0 | 3.9 |
| Engine No. 23, Solvay and W. Jefferson | 114.62 | 10.0 | 36 | 16 | 26.8 | ..... | 37 | 15 | 30.7 | ..... | 0.8 | ..... | 26.0 | 33.5 | 2.2 |
| Truck No. 13, Fort and Lewercenz | 115.96 | 9.4 | 36 | 16 | 26.8 | ..... | 38 | 16 | 30.2 | ..... | 1.0 | ..... | 25.0 | 32.0 | 3.5 |
| Engine No. 27, Junction and Rogers | 113.74 | 12.7 | 38 | 18 | 30.8 | ..... | 39 | 17 | 32.0 | ..... | 0.8 | ..... | 27.0 | 33.0 | 3.3 |
| Engine No. 22, Michigan, near Hammond | 121.37 | 11.8 | 39 | 20 | 32.0 | ..... | 37 | 18 | 33.0 | ..... | 0.6 | ..... | 28.5 | 33.0 | ..... |
| Truck No. 10, Sheridan and Mack | 140.26 | 30.9 | 30 | 17 | 23.5 | ..... | 36 | 16 | 28.6 | ..... | 1.2 | ..... | 21.0 | 30.0 | 3.9 |
| Engine No. 18, Mt. Elliott near Sylvester | 146.23 | 23.5 | 28 | 14 | 21.7 | ..... | 36 | 8 | 23.4 | ..... | 0.6 | ..... | 16.5 | 22.5 | 2.3 |
| Engine No. 1, Grand, near Gratiot | 143.21 | 22.2 | 28 | 16 | 24.0 | ..... | 29 | 8 | 24.1 | ..... | 0.3 | ..... | 16.0 | 21.0 | 1.2 |
| Engine No. 6, High, near Hastings | 142.63 | 21.9 | 20 | 12 | 20.6 | ..... | 25 | 13 | 20.1 | ..... | 0.9 | ..... | 15.5 | 24.0 | 3.8 |
| Storage Yard, Orleans and Erskine | 150.64 | 25.4 | 23 | 17 | 16.2 | ..... | 22 | 5 | 15.9 | ..... | 0.6 | ..... | 12.5 | 20.0 | 4.3 |
| Truck No. 5, Russell and Erskine | 147.74 | 24.1 | 24 | 16 | 16.9 | ..... | 22 | 7 | 17.8 | ..... | 0.5 | ..... | 16.5 | 16.0 | 6.1 |
| Engine No. 3, Alexandrine, near Cass | 146.48 | 24.5 | 24 | 16 | 17.4 | ..... | 27 | 3 | 20.1 | ..... | 0.8 | ..... | 14.5 | 18.0 | 5.1 |
| Engine No. 12, Sixteenth and Grand River | 141.55 | 21.5 | 28 | 11 | 30.0 | ..... | 27 | 7 | 22.2 | ..... | 0.3 | ..... | 17.0 | 21.5 | 8.2 |
| Engine No. 31, Cobb and W. Grand Blvd. | 155.12 | 18.7 | 28 | 13 | 21.3 | ..... | 29 | 7 | 22.2 | ..... | 0.6 | ..... | 17.0 | 22.5 | 2.7 |
| Engine No. 20, Baldwin and Gratiot | 145.37 | 23.1 | 30 | 13 | 21.6 | ..... | 30 | 6 | 21.8 | ..... | 0.2 | ..... | 15.0 | 21.5 | 4.5 |
| Average | | | 79 | 45 | 64.7 | 27.2 | 104 | 45 | 65.7 | 27.7 | ..... | ..... | 70.5 | 80.0 | 1.1 |
| Pumping Station | 92.00 | ..... | 79 | 45 | 64.7 | ..... | 104 | 45 | 65.7 | ..... | ..... | ..... | 70.5 | 80.0 | ..... |
| Engine No. 18, Mt. Elliott, near Sylvester | 146.23 | 23.5 | 49 | 30 | 39.4 | ..... | 49 | 31 | 40.3 | ..... | 0.1 | ..... | 42.0 | 38.5 | ..... |
| Engine No. 23, Moran and Boulevard | 154.29 | 27.0 | 43 | 23 | 31.9 | ..... | 41 | 21 | 32.8 | ..... | 0.1 | ..... | 33.0 | 31.0 | 2.0 |
| Engine No. 13, Ripelle and Milwaukee | 155.56 | 27.5 | 36 | 17 | 28.5 | ..... | 37 | 14 | 29.8 | ..... | 0.3 | ..... | 28.0 | 29.0 | 3.5 |
| Engine No. 28, Cass and Ferry | 157.90 | 28.3 | 36 | 18 | 28.1 | ..... | 36 | 19 | 29.8 | ..... | 0.7 | ..... | 26.5 | 26.5 | 2.2 |
| Engine No. 17, Cass and Amsterdam | 152.83 | 26.3 | 33 | 12 | 25.9 | ..... | 36 | 18 | 28.5 | ..... | 1.3 | ..... | 23.0 | 23.2 | 5.2 |
| Engine No. 21, Lincoln, near Piquette | 154.86 | 27.2 | 31 | 10 | 23.7 | ..... | 32 | 15 | 26.5 | ..... | 1.8 | ..... | 26.0 | 27.5 | 3.4 |
| Engine No. 24, Kentworth, near John R | 155.86 | 27.6 | 33 | 10 | 26.4 | ..... | 35 | 20 | 28.9 | ..... | 1.5 | ..... | 26.0 | 29.0 | 11.5 |
| Engine No. 12, Sixteenth and Grand River | 141.55 | 21.5 | 31 | 9 | 24.6 | ..... | 30 | 14 | 24.3 | ..... | 1.3 | ..... | 17.5 | 27.0 | 8.2 |
| Storage Yard, Orleans and Erskine | 150.64 | 25.4 | 44 | 21 | 31.7 | ..... | 43 | 20 | 30.8 | ..... | 1.9 | ..... | 33.0 | 27.5 | 7.1 |
| Engine No. 1, Hamtramck (Nov. 9, 1915 on) | | | | | 32.5 | ..... | 35 | 14 |  | ..... | ..... | ..... | 16.0 | 26.5 | ..... |
| Average | | | | | 32.5 | ..... |  |  | 33.7 | ..... | ..... | ..... |  |  | ..... |

Note—Engine No. 1, Hamtramck, not averaged with high service.





PIPE SYSTEM

There were laid during the year a total of 259,671 feet or 49.18 miles of water mains, and 5,044 feet or 0.95 miles of small obsolete mains were removed and replaced with larger ones—a net gain of 48.23 miles and making a total of 1,004.84 miles of water mains in the entire system. The quantities given in the summary of pipe laid in Detroit and outside villages represent the lines actually completed, and for which the complete costs have been recorded.

Of the total mileage of pipe, 151.14 miles or 15.04 per cent. is 12 inches in diameter and larger, of which 50.24 miles is 42 inches and 48 inches in diameter, 8 miles of these two largest sizes having been laid during the past year.

The most important work accomplished in the line of water main extensions, was the completion of the Jefferson Avenue 48 inch main, work on which was well under way during the preceding year. This main extends from the Pumping Station west on Jefferson to Sixth; north on Sixth to Pine; east on Pine to Fourth, and north on Fourth to Peterboro, connecting at this point with the Charlevoix Avenue 48 inch main, thus forming a complete loop of 48 inch pipe. Connections were also made between this main and the 42 inch main at Sixth and Lafayette and the 48 inch main at Sixth and High Streets.

The extension of the Baker Street 48 inch main, necessitated by the widening and double tracking of that thoroughfare, was completed to Vinewood Avenue, where connection was made with the 24 inch main.

On the high service the extension of the 42 inch main was completed from Canfield and St. Antoine to West Grand Boulevard and Twelfth Street, joining there with the 24 inch main on the Boulevard, and the 36 inch main extending north

on Twelfth Street, the latter also having been extended north on Twelfth Street to Burlingame Avenue.

The total construction cost of water mains for the year was \$864,732.35, and the unit costs of the various sizes are shown in the table below:

COST PER FOOT.

| Size | No. of Feet | Material, etc. | Labor | Overhead Expense | Total |
|------|-------------|----------------|--------|------------------|--------|
| 4" | 804 | \$.56 | \$.37 | \$.05 | \$.98 |
| 6" | 118,523 | .64 | .45 | .05 | 1.14 |
| 8" | 81,010 | .70 | .45 | .05 | 1.20 |
| 10" | 2,055 | 1.28 | 1.02 | .11 | 2.41 |
| 12" | 3,908 | 1.58 | .96 | .11 | 2.65 |
| 16" | 208 | 2.64 | 1.13 | .13 | 3.90 |
| 24" | 5,095 | 3.74 | 1.98 | .25 | 5.97 |
| 48" | 29,581 | 11.74 | 7.21 | .84 | 19.79 |

The following tables give full detailed information relating to all water mains laid during the year both in Detroit and surrounding territory and also a summary of all mains in the distribution system.

Report of Pipe Laid, July 1st, 1915, to June 30th, 1916

| Size | Detroit | | | Grosse Pointe Parks | St. Clair Heights | Hamtramck | Greenfield | Oakwood | Grosse Pointe Township | Outside City | | Entire System | | | |
|-------|-----------|--------|-------------|---------------------|-------------------|-----------|------------|-----------|------------------------|--------------|---|---------------|--------|-------------------|----------|
| | Feet Laid | % | Dis-cont'd. | Feet Laid | Feet Laid | Feet Laid | Feet Laid | Feet Laid | Feet Laid | Feet Laid | % | Total Laid | % | Total Dis-cont'd. | Net Gain |
| 2' | | | 1,106 | | | | | | | | | | | 1,106 | —1106 |
| 3' | | | 2,280 | | | | | | | | | 804 | .33 | 2,280 | —1456 |
| 4' | 804 | .43 | | | | | | | | | | 118,523 | 49.14 | 1,487 | 117,036 |
| 6' | 76,932 | 41.30 | 1,487 | 1,660 | 19,195 | 2,061 | 3,148 | 1,845 | 41,591 | 75.7 | | 81,010 | 33.59 | | 81,010 |
| 8' | 67,988 | 36.50 | | 4,595 | 4,957 | 3,470 | | | 13,022 | 23.8 | | 2,055 | .85 | | 2,055 |
| 10' | 2,055 | 1.10 | | | | | 285 | | | 5 | | 3,908 | 1.62 | 191 | 3,717 |
| 12' | 3,623 | 1.94 | 191 | | | | | | 285 | | | 208 | .09 | | 208 |
| 16' | 208 | .11 | | | | | | | | | | | | | |
| 18' | | | | | | | | | | | | | | | |
| 20' | | | | | | | | | | | | | | | |
| 24' | 5,095 | 2.74 | | | | | | | | | | 5,095 | 2.11 | | 5,095 |
| 30' | | | | | | | | | | | | | | | |
| 36' | | | | | | | | | | | | | | | |
| 42' | | | | | | | | | | | | | | | |
| 45' | | | | | | | | | | | | | | | |
| 48' | 29,581 | 15.88 | | | | | | | | | | 29,581 | 12.27 | | 29,581 |
| Feet | 186,286 | 100.00 | 5,044 | 1,660 | 24,152 | 5,816 | 3,148 | 1,845 | 54,898 | 100 | | 241,184 | 100.00 | 5,044 | 236,140 |
| Miles | 35.29 | | 0.95 | 0.31 | 4.57 | 1.10 | 0.60 | 0.35 | 10.39 | | | 45.68 | | 0.95 | 44.73 |

Additional Pipe Laid on Which Costs Were Not Complete

| | | | | | | | | | | | | | | |
|----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|-------|-------|---------|
| 36' | 5,856 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5,856 | ..... | ..... | ..... |
| 42' | 12,631 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12,631 | ..... | ..... | ..... |
| Tot. Ft. | 204,773 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 259,671 | ..... | ..... | 254,627 |
| Tot. Mls | 38.78 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 49.18 | ..... | ..... | 48.23 |

**Summary of the Amount and Cost of Pipe Laid in Detroit and Outside
Villages, Year Ending June 30th, 1916**

| Location | Feet | Size | Material
Etc. | Labor | Overhead
Expense | Total | Grand
Total |
|--------------------------------|---------|------|------------------|--------------|---------------------|--------------|----------------|
| City of Detroit..... | 804 | 4" | \$ 449.02 | \$ 303.32 | \$ 37.28 | \$ 789.62 | \$ |
| | 76,932 | 6" | 48,718.92 | 38,005.25 | 4,568.41 | 91,892.58 | ..... |
| | 67,988 | 8. | 48,397.46 | 32,409.45 | 3,807.97 | 84,614.88 | ..... |
| | 2,055 | 10" | 2,623.00 | 2,102.30 | 230.01 | 4,955.31 | ..... |
| | 3,023 | 12" | 5,840.02 | 3,611.00 | 399.95 | 9,851.97 | ..... |
| | 208 | 16" | 548.22 | 235.28 | 27.25 | 810.75 | ..... |
| | 5,093 | 24" | 19,076.41 | 10,063.74 | 1,284.30 | 30,444.45 | ..... |
| | 29,581 | 48" | 347,150.45 | 213,365.90 | 24,707.98 | 585,233.12 | 808,592.28 |
| Village of Hamtramck..... | 13,631 | 6" | 9,601.14 | 3,158.23 | 609.83 | 15,369.20 | ..... |
| | 4,957 | 8" | 3,629.82 | 2,033.04 | 247.38 | 5,910.84 | ..... |
| Township of Hamtramck..... | 3,504 | 6" | 1,903.02 | 1,027.02 | 127.35 | 3,057.99 | 21,280.04 |
| Village of Grosse Pt. Pks.... | 13,882 | 6" | 9,784.70 | 989.31 | 110.96 | 2,491.39 | 3,057.99 |
| | 4,595 | 8" | 2,145.50 | 5,717.03 | 679.92 | 10,181.85 | ..... |
| Township of Greenfield..... | 2,061 | 6" | 1,441.42 | 982.40 | 113.85 | 3,241.75 | ..... |
| | 3,470 | 8" | 2,072.68 | 128.25 | 14.86 | 493.76 | 19,423.60 |
| | 285 | 12" | 390.05 | 1,357.94 | 157.23 | 3,587.85 | ..... |
| Village of Oakwood..... | 3,148 | 6" | 1,838.30 | 1,029.31 | 134.74 | 3,002.35 | ..... |
| Township of Grosse Pointe... | 1,845 | 6" | 801.37 | 564.99 | 30.21 | 1,402.57 | ..... |
| Village of St. Clair Heights.. | 1,000 | 6" | 838.19 | 503.97 | 58.36 | 1,400.52 | ..... |
| | 241,154 | | \$507,219.29 | \$320,160.22 | \$ 37,352.84 | \$864,732.35 | \$864,732.35 |

Pipe Laid Year Ending June 30th, 1916

| | Feet | Size |
|--|-------|------|
| Apr. 26, Alexandrine E., Moran..... | 15 | 4" |
| Dec. 8, Algonquin, Jefferson South | 888 | 8" |
| Sept. 14, Alley E., Library, Gratiot to Gd. River..... | 419 | 8" |
| Mar. 28, Alter Road N., Waterloo North..... | 667 | 6" |
| Aug. 7, Alter Road N., Waterloo North..... | 364 | 6" |
| July 14, Apple, St. John North..... | 86 | 6" |
| St. John, 36' E., Apple West..... | 351 | 8" |
| Dec. 3, Ashland S., Kercheval..... | 32 | 6" |
| Dec. 10, Atkinson W., Wilson West..... | 519 | 6" |
| Jan. 11, Auderdon, Kercheval to N. Waterloo..... | 1,053 | 8" |
| Aug. 2, Anderson, Nall to Conant..... | 826 | 8" a |
| May 13, Audrain, Clippert to Martin..... | 539 | 6" |
| July 29, Baker, 16th to Vinewood..... | 4,125 | 48" |
| Baker and Vinewood | 32 | 24" |
| Nov. 24, Barry, McClellan East..... | 560 | 6" |
| May 7, Beaconsfield N., Jefferson..... | 1,525 | 8" c |
| Dec. 28, Bedford Rd., S., St. Paul to Mack..... | 3,451 | 6" c |
| July 19, Beechwood S., Milford North..... | 572 | 8" |
| Sept. 16, Bellevue, Warren to Forest..... | 840 | 8" |
| Apr. 5, Bellevue, Miller North..... | 673 | 6" |
| Concord, Miller North..... | 679 | 6" |
| Canton, Miller North..... | 671 | 6" |
| Helen, Miller North..... | 672 | 6" |
| Field, Miller North..... | 673 | 6" |
| Miller, Helen to Field..... | 938 | 6" |
| Schmitz, Center Line to W. Concord..... | 639 | 6" |
| Concord, Schmitz South..... | 290 | 6" |
| Gable, Center Line East..... | 208 | 6" |
| Center Line, Harper to N. Erbie..... | 2,460 | 8" |
| Piscopink, Center Line East..... | 944 | 8" |
| Nov. 23, Belvidere, S. Graves..... | 138 | 6" |
| Dec. 18, Boulevard, Trombley North..... | 158 | 6" |
| Nov. 13, Boulevard, Beaufait to Bellevue..... | 373 | 6" |
| July 28, W. Gd. Blvd., Linwood to Wade..... | 366 | 6" |
| July 9, E. Gd. Blvd., 197' E., Elmwood East..... | 292 | 6" |
| Dec. 21, Brentwood, Woodward East..... | 1,917 | 8" |
| Glenmere, Woodward East..... | 2,036 | 6" |
| Nov. 24, Bruckner, Parkinson East..... | 240 | 8" |
| Feb. 9, Buckingham, N., Jefferson North..... | 1,752 | 6" c |
| May 18, Burns, N. & S., Moffat..... | 562 | 8" |
| Mar. 9, Burns, Canfield South..... | 141 | 8" |
| Oct. 19, Burns, N. Moffat..... | 133 | 8" |
| Aug. 17, Burns, S. Canfield..... | 158 | 8" |
| May 16, Cabot, Mandale North..... | 370 | 6" |
| Lawndale and Navy, Set 8" gate..... | | |
| Lawndale and Rathbone, Set 8" gate..... | | |
| Lawndale and Longworth, Set 8" gate..... | | |
| Feb. 25, Cadillac, Jean South..... | 190 | 6" |
| Nov. 10, Cahalan, Central West..... | 171 | 8" |
| Dec. 18, Calvert, W. Hamilton Blvd..... | 762 | 6" |
| Dec. 3, Cardoni, N. Woodland..... | 61 | 8" |
| Nov. 22, Central, N. Panama..... | 72 | 10" |

| | | Feet | Size |
|-----------|---|-------|------|
| Sept. 22, | Central, Navy to Cahalan..... | 550 | 12" |
| | Cahalan, Central East..... | 451 | 8" |
| Jan. 6, | Central, Lodge South..... | 367 | 6" |
| Apr. 1, | Central, Cahalan to Lane..... | 267 | 12" |
| | Lane, Central East..... | 275 | 6" |
| Sept. 18, | Clairmont, Wilson West..... | 162 | 6" |
| Nov. 18, | Clairepointe, N. Freud..... | 220 | 8" |
| May 24, | Clairepointe, N. & S. Freud..... | 180 | 8" |
| July 20, | Clippert, Audrain to Dennis..... | 529 | 8" |
| July 29, | Chalmers N., Essex South..... | 160 | 8" |
| Oct. 4, | Chalmers, Kercheval North..... | 708 | 6" |
| Feb. 23, | Collingwood W., Hamilton West..... | 1,916 | 8" |
| July 13, | Comstock, Conant East..... | 591 | 6" a |
| Dec. 4, | Conant, Mt. Elliott North..... | 1,049 | 8" |
| May 20, | Connor, N. & S. Freud..... | 559 | 6" |
| Oct. 24, | Cooper, Warren South..... | 426 | 8" |
| Sept. 24, | Coplin, Kercheval to N. Waterloo..... | 1,345 | 6" |
| July 9, | Daniels, Horatio North..... | 163 | 6" |
| Nov. 11, | Daniels, McGraw South..... | 224 | 6" |
| Aug. 25, | Delmar, N. Westminister..... | 157 | 8" |
| Aug. 25, | Delmar, Caniff South..... | 500 | 8" |
| Dec. 18, | Delmar, N. Westminister..... | 160 | 8" |
| Mar. 6, | Dequindre, Kenwood to Westminister..... | 1,021 | 8" |
| | Dyar, Kenwood to Westminister..... | 1,015 | 6" a |
| July 16, | Dequindre, Belmont South..... | 451 | 8" a |
| Aug. 21, | Dexter Blvd. crossings..... | 432 | 6" |
| | Euclid to Forestdale..... | 344 | 10" |
| Mar. 10, | Dexter, Maidstone North..... | 217 | 10" |
| Mar. 31, | Devonshire, Jefferson North..... | 3,253 | 6" c |
| May 2, | Dickerson, N. & S. Waterloo..... | 1,408 | 8" |
| May 11, | Drake, S. Freud..... | 607 | 6" |
| Nov. 11, | Drake, S. Freud..... | 62 | 6" |
| Nov. 26, | Drexel, S. Waterloo to N. Charlevoix..... | 1,415 | 8" |
| Oct. 8, | Drexel, Kercheval North..... | 662 | 8" |
| Aug. 18, | Duncan, Van Dyke to Baldwin..... | 487 | 6" |
| Sept. 10, | Dupont, Graham North..... | 146 | 4" |
| July 17, | Edison, 203' W. Wilson West..... | 269 | 8" e |
| Dec. 9, | Edison, W. Hamilton Blvd..... | 298 | 8" |
| July 7, | Edward crossing Martin..... | 46 | 6" |
| Oct. 12, | Elmwood, Caniff to Casemere..... | 948 | 6" |
| | Sobieski, Caniff to Carpenter..... | 2,670 | 6" |
| | Nall, Carpenter to Casemere..... | 1,783 | 6" a |
| Nov. 5, | Elsmere, Mason Place South..... | 174 | 8" |
| | Mason Place, Elsmere East..... | 144 | 8" |
| May 26, | Emerson, S. Freud..... | 639 | 6" |
| Dec. 24, | Engle, S. Edlie..... | 62 | 6" |
| Oct. 11, | Engle, S. Edlie..... | 62 | 6" |
| Nov. 5, | Epworth Blvd., Warren to N. Milford..... | 1,500 | 8" |
| | Milford, crossing Epworth..... | 25 | 6" |
| Dec. 23, | Epworth Blvd., N. Milford..... | 128 | 8" |
| Jan. 10, | Euclid, Gd. River E..... | 437 | 6" |
| May 13, | Evans, S. Freud..... | 422 | 6" |
| Aug. 30, | Farnsworth, Moran to Elmwood..... | 698 | 6" |
| Sept. 17, | Farrand, Pennsylvania West..... | 156 | 6" |

| | Feet | Size |
|--|-------|------|
| Oct. 14, Fleming, Caniff to Carpenter..... | 2,636 | 8" |
| St. Aubin, Caniff to Carpenter..... | 2,624 | 6" |
| Lumpkin, Caniff to Carpenter..... | 2,623 | 6" |
| | 23 | 8" |
| Crossings in above streets..... | 199 | 6" a |
| July 30, Forman, crossing Wabash R. R..... | 199 | 4" |
| Aug. 24, Fort St. W., Pleasant to Dearborn..... | 2,760 | 6" |
| S. Dearborn, Fort St. S..... | 388 | 6" f |
| Apr. 5, Foster, N. Strong..... | 616 | 6" |
| Nov. 5, Foster, Miller to Kosciuszko..... | 728 | 6" |
| Kosciuszko, Mt. Elliott..... | 433 | 6" |
| Miller, West of Foster..... | 460 | 6" b |
| Sept. 21, 14th, A. S., Lothrop South..... | 184 | 8" |
| Sept. 16, Fourth, Peterboro to Pine..... | 1,725 | 48" |
| Pine, 4th to 6th..... | 765 | 48" |
| 6th, Pine to Lafayette..... | 4,082 | 48" |
| Fourth, Bagg to Gd. River..... | 825 | 8" |
| Feb. 24, Garland, Gratiot to McClellan..... | 520 | 8" |
| McClellan, Garland North..... | 87 | 6" |
| Dec. 15, Garland, Forest to N. Warren..... | 1,660 | 6" g |
| May 19, Gartner, E. Central..... | 290 | 6" |
| Nov. 10, Gartner, Central East..... | 204 | 6" |
| Sept. 9, Gartner, Lawndale East..... | 776 | 6" |
| Aug. 25, Gladys, Livernois West..... | 342 | 6" |
| Dec. 16, Glynn Ct., W. Hamilton Blvd..... | 344 | 8" |
| Aug. 7, Goethe, Pennsylvania West..... | 144 | 6" |
| Aug. 10, Hamilton, 1,175' S., Jefferson South..... | 122 | 6" |
| July 9, Hanover crossing, LaSalle Gds. S..... | 36 | 8" |
| LaSalle Gds., Hanover East..... | 101 | 8" |
| Dec. 8, Harbor, W. Ashland..... | 16 | 6" |
| Apr. 18, Harper, Woodward East..... | 220 | 8" |
| Aug. 20, Harper Ct., S. Harper..... | 288 | 4" |
| May 20, Harry, E. McClellan..... | 100 | 6" |
| Nov. 3, Hartwick, Clay North..... | 1,261 | 8" |
| Sept. 18, Hazelwood, E. of Wilson West..... | 742 | 6" |
| Aug. 20, Heidelberg, crossing McDougall..... | 36 | 6" |
| Berlin, McDougall to Elmwood..... | 745 | 8" |
| Nov. 3, Hillger, Mack South..... | 977 | 6" d |
| July 9, Hogarth, Linwood West..... | 374 | 8" |
| Linwood, Whitney to Hogarth..... | 256 | 8" |
| Linwood, crossing Maidstone..... | 28 | 8" |
| Nicolet, crossing Linwood..... | 30 | 6" |
| Vicksburg, crossing Linwood..... | 60 | 6" |
| Linwood, crossing Whitney..... | 37 | 8" |
| Linwood, crossing Hogarth..... | 23 | 8" |
| Linwood, crossing Lothrop..... | 33 | 8" |
| Linwood, crossing Northwestern..... | 22 | 8" |
| A. N. Lamothe, crossing Linwood..... | 58 | 6" |
| Linwood, crossing LaSalle Gds. N..... | 28 | 8" |
| Aug. 3, Holmes, Mackay to Fleming..... | 726 | 6" |
| Mackay, crossing Tolmes..... | 73 | 6" a |
| Dec. 31, Homer, Elsmere West..... | 441 | 6" |
| Aug. 2, Homer, Elsmere East..... | 240 | 6" |
| Sept. 3, Honorah, Dix to S. of Pitt..... | 1,046 | 6" |

| | | Feet | Size |
|-----------|--|-------|------|
| July 10, | Hugo, 404' E. Conant East..... | 322 | 6" a |
| Nov. 15, | Hupp, N. of Essex..... | 245 | 8" |
| Aug. 13, | Hurlbut, N. of Moffat South..... | 446 | 8" |
| July 27, | Iosco, crossing Gd. River..... | 74 | 6" |
| | Arcadia, crossing Gd. River..... | 74 | 6" |
| Jan. 8, | Iosco, Mackinaw West..... | 62 | 6" |
| May 23, | Inglis, N. Ferndale..... | 76 | 6" |
| Aug. 27, | Ironwood, Moore Place North..... | 35 | 8" |
| Aug. 18, | Iroquois, S. Sylvester..... | 75 | 8" |
| Aug. 14, | Iroquois, Forest South..... | 450 | 8" |
| Dec. 7, | Iroquois, N. Waterloo..... | 763 | 8" |
| May 2, | Iroquois, N. Harper..... | 171 | 8" |
| Apr. 18, | Jefferson, Island View to Lodge..... | | |
| | Lodge, Jefferson South..... | 688 | 8" |
| Jan. 5, | Jefferson, 304' E., Bellevue East..... | 499 | 48" |
| Dec. 3, | Jefferson W., Hastings to 6th..... | 6,129 | 48" |
| | 6th, Jefferson to Lafayette..... | 982 | 48" |
| Dec. 27, | Jefferson, Chene to Beaufait..... | 4,878 | 48" |
| Nov. 26, | John R., Hugo to Savannah..... | 285 | 12" |
| | Savannah, Wilson to John R..... | 1,284 | 8" |
| | Iowa, E. John R..... | 25 | 6" e |
| July 20, | Kensington Rd., S. St. Paul to Mack..... | 3,329 | 6" c |
| Dec. 31, | Kercheval, Oneida West..... | 208 | 16" |
| | | 6 | 8" |
| Nov. 5, | Lafayette E., Lawndale..... | 72 | 6" |
| Nov. 27, | Lakeview, 246' S., Kercheval North..... | 782 | 8" |
| Oct. 2, | Lakeview, N. Kercheval..... | 60 | 8" |
| Nov. 17, | Lakewood, N. Freud to S. Essex..... | 1,489 | 8" |
| Aug. 2, | Lamothe, Dunedin East..... | 238 | 6" |
| Nov. 5, | Lane, Lawndale West..... | 425 | 8" |
| Mar. 15, | LaSalle Gds. N., E. 14th East..... | 326 | 6" |
| July 3, | LaSalle Gds. S., crossing Dunedin..... | 37 | 8" |
| | Bethune, crossing Dunedin..... | 24 | 6" |
| | Dunedin, LaSalle Gds. S., North..... | 126 | 6" |
| Aug. 5, | LaSalle Gds. S., 12th to Dunedin..... | 489 | 8" |
| Aug. 6, | Ledyard, 3rd to 4th..... | 269 | 6" |
| May 24, | Lee Place, W. Wilson..... | 1,053 | 6" |
| Sept. 28, | Lenox, Charlevoix South..... | 615 | 8" |
| July 22, | Lenox, 164', S. Waterloo North..... | 635 | 8" |
| July 21, | Linslade, Gd. River West..... | 310 | 6" |
| July 8, | Linwood, N. Columbus South..... | 171 | 8" |
| Aug. 14, | Linwood, Hogarth South..... | 114 | 8" |
| July 19, | Lishon, Beard West..... | 340 | 6" |
| Nov. 12, | Lishon, Green East..... | 400 | 6" |
| Nov. 10, | Lodge, Central East..... | 412 | 6" |
| Nov. 10, | Logan, Central East..... | 390 | 6" |
| Sept. 28, | Longworth, Elsmere East..... | 298 | 8" |
| Aug. 26, | Longworth, E. Elsmere..... | 90 | 8" |
| July 12, | Lumley, 964' N., Michigan North..... | 60 | 6" |
| Nov. 2, | Lycaste, Mack South..... | 806 | 6" |
| Oct. 28, | Lycaste, S. Goethe..... | 52 | 6" |
| Dec. 23, | Lycaste, S. Mack..... | 62 | 6" d |
| Sept. 13, | Lyman, Dubois to St. Aubin..... | 526 | 6" |
| Nov. 10, | McGraw, Gilbert to W. Cicotte..... | 487 | 6" |

| | | Feet | Size |
|-----------|---|-------|------|
| Oct. 28, | McGraw, Wesson to Military..... | 750 | 8" |
| | McGraw, Military to Livernois..... | 418 | 8" |
| | McGraw, Wesson West..... | 70 | 8" |
| | Wesson, McGraw North..... | 64 | 8" |
| Sept. 14, | McGraw, 35th to Campbell..... | 268 | 6" |
| | 35th, McGraw North..... | 131 | 6" |
| | Campbell, McGraw North..... | 179 | 6" |
| July 14, | McGraw, 32nd St. E..... | 131 | 6" |
| July 9, | McGraw, W. Livernois to Gilbert..... | 60 | 6" |
| Aug. 2, | Mackay, Stuart South..... | 154 | 6" |
| | Burger, Mackay to Fleming..... | 724 | 6" a |
| Aug. 2, | Mackay, Virginia South..... | 156 | 6" |
| | Casmere to Mackay to Fleming..... | 724 | 6" a |
| Nov. 16, | Mackie, Harbough East..... | 501 | 6" |
| Oct. 13, | Mackinaw, S. of Iosco to Petoskey..... | 623 | 6" |
| Apr. 7, | Maidstone, E. & W., Holmur..... | 440 | 8" |
| Jan. 11, | Maidstone, 377' W., Dexter Blvd..... | 110 | 8" |
| Jan. 10, | Maidstone, E. Radford East..... | 74 | 8" |
| Oct. 6, | Maidstone, Radford East..... | 521 | 8" |
| Aug. 17, | Maidstone, W. Dexter Blvd..... | 108 | 8" |
| July 13, | Maidstone, Dexter West..... | 344 | 8" |
| Dec. 3, | Manistique, N. Essex..... | 212 | 8" |
| Aug. 5, | Manistique, S. Jefferson..... | 1,410 | 8" |
| Oct. 20, | Maplewood W., Ironwood to Thornton..... | 937 | 6" |
| Aug. 28, | Maplewood W., Ironwood..... | 151 | 6" |
| Nov. 12, | Marlborough, S. Kercheval..... | 18 | 6" |
| Oct. 11, | Meadowbrook, S. Jefferson..... | 74 | 6" |
| Aug. 11, | Meadowbrook, S. Jefferson..... | 256 | 6" |
| Sept. 1, | Michigan, Central to City Limits..... | 1,190 | 24" |
| Dec. 23, | Milford, W. Epworth Blvd..... | 408 | 6" |
| Apr. 4, | Miller, Mt. Elliott East..... | 209 | 6" |
| Oct. 11, | Montclair, S. Edlie..... | 274 | 8" |
| May 30, | Montclair, N. & S. Shoemaker..... | 2,031 | 6" |
| | Garland, Shoemaker to Harper..... | 2,176 | 6" |
| | Bewick, Shoemaker to N. Harper..... | 1,158 | 6" g |
| July 11, | Muster W., Artillery West..... | 45 | 6" |
| Jan. 22, | Nardin, Gd. River East..... | 871 | 8" |
| Apr. 12, | Navahoe, Jefferson South..... | 813 | 8" |
| Sept. 4, | Navy, Green West..... | 365 | 8" |
| Mar. 28, | Othmar, Livernois to Reaume..... | 317 | 6" |
| | Reaume, Othmar to Gd. River..... | 1,215 | 6" |
| | Georgeland, Livernois West..... | 280 | 6" |
| Nov. 3, | Oliver, E. Conant..... | 389 | 6" a |
| Jan. 21, | Pacific, 662' W., Ironwood West..... | 183 | 8" |
| Aug. 28, | Pacific, W. Ironwood..... | 40 | 8" |
| Aug. 14, | Parker, Sylvester South..... | 158 | 6" |
| May 11, | Parkinson, Michigan South..... | 790 | 8" |
| Nov. 13, | Parkinson, Bulwer to Clayton..... | 257 | 6" |
| | Bulwer, Parkinson West..... | 181 | 6" |
| May 12, | Parkwood, W. Martin..... | 91 | 6" |
| Nov. 22, | Parkwood, E. Central..... | 612 | 6" |
| July 12, | Parkwood, from Martin West..... | 591 | 6" |
| Dec. 2, | Pennsylvania, Jean South..... | 233 | 6" |

| | Feet | Size | |
|---|---|-------|-----|
| Aug. 27, Perrien, Abbott to Gt. Lakes..... | 650 | 6" | |
| | 70 | 6" | |
| Feb. 11, Peter Hunt, Gratiot to W. Newland..... | 3,542 | 8" | |
| Feb. 17, Philadelphia W., Hamilton West..... | 216 | 6" | |
| Feb. 11, Philadelphia W., Wilson West..... | 93 | 6" | |
| Oct. 26, Philadelphia E. Russell..... | 476 | 6" | |
| Aug. 9, Philadelphia E. Wilson to W. Same..... | 509 | 6" | |
| Dec. 1, Phillip, Kercheval North..... | 380 | 6" | |
| Nov. 6, Phillip, N. Essex..... | 328 | 8" | |
| May 26, Phillips, N. Kercheval..... | 296 | 6" | |
| Apr. 24, Pillard, Gd. River East..... | 945 | 6" | |
| May 17, Piper, S. Freud..... | 243 | 8" | |
| Nov. 13, Piper Blvd., N. Freud to S. Freud..... | 234 | 8" | |
| Dec. 30, Plymouth, Pontchartrain to Monica..... | 642 | 12" | |
| | Pontchartrain, Plymouth North..... | 480 | 12" |
| | Monica, Plymouth North..... | 768 | 6" |
| | Plymouth, crossing Pontchartrain..... | 15 | 6" |
| July 12, Proctor, 498' N., Michigan North..... | 73 | 8" | |
| Dec. 18, Pumping Station grounds from No. 10 group to
east of driveway at Main Entrance..... | 943 | 48" | |
| | Jefferson Pumping Station to E. of Seyburn Ave..... | 5,453 | 48" |
| Jan. 8, Quincy, Gd. River North..... | 1,360 | 8" | |
| July 20, Rademacher, 327' N., Lafayette North..... | 63 | 8" | |
| Sept. 25, Rademacher, N. Lafayette..... | 61 | 8" | |
| Nov. 12, Rademacher, N. Lafayette North..... | 205 | 8" | |
| July 21, Richmond, Euclid South..... | 131 | 6" | |
| May 24, Rieden, Dix South..... | 208 | 6" | |
| Sept. 2, St. John, Central to E. Ewers..... | 1,220 | 6" | |
| May 11, St. John, Larkins West..... | 112 | 8" | |
| Apr. 28, St. Joseph, Gratiot West..... | 170 | 6" | |
| Aug. 28, Second, Jefferson to Front..... | 208 | 10" | |
| July 26, Senator, Green East..... | 258 | 6" | |
| | Navy, Green East..... | 443 | 8" |
| | Green, Ferndale to Navy..... | 817 | 8" |
| July 20, Senator, Central East..... | 235 | 6" | |
| Aug. 31, Senator, E. of Central..... | 269 | 6" | |
| May 31, Seneca, S. Canfield..... | 90 | 8" | |
| Aug. 17, Seneca, S. Canfield..... | 49 | 8" | |
| Aug. 20, Seneca, Moffat North..... | 82 | 8" | |
| Nov. 11, Seward, E 14th..... | 146 | 8" | |
| Aug. 31, Seward, 14th East..... | 180 | 6" | |
| Jan. 15, Seward, 298' E., 14th East..... | 147 | 8" | |
| May 16, Sharon, Mandale North..... | 455 | 6" | |
| July 2, Solvay, 136' S. of M. C. R. R., N..... | 156 | 4" | |
| Nov. 29, Springle, Kercheval North..... | 1,145 | 6" | |
| May 24, Stair, N. Ferndale..... | 717 | 8" | |
| Mar. 7, Sterritt, Gratiot East..... | 753 | 8" | |
| July 30, Stone, E. of Woodmere East..... | 79 | 6" | |
| Mar. 1, Strong, Carrie East..... | 185 | 6" | |
| Feb. 16, Strong, W. Bellevue to Foster..... | 342 | 8" | |
| | Foster, Strong North..... | 437 | 6" |
| July 23, Taylor, Hamilton to Twelfth..... | 2,658 | 24" | |
| | Wilson, crossing Taylor..... | 51 | 6" |

| | | Feet | Size |
|----------|--|-------|------|
| | Hazelwood, Hamilton to Third..... | 925 | 24" |
| | Schmittdiel, crossing Taylor..... | 51 | 6" |
| | Hamilton, Taylor to Hazelwood..... | 290 | 24" |
| Nov. 8, | Tennessee, N. Freud South..... | 342 | 8" |
| Jan. 21, | Tennyson, 112' N., Freud South..... | 1,175 | 8" |
| Jan. 10, | Thaddeus, 815' W. Harbough West..... | 482 | 6" |
| Nov. 16, | Thaddeus, W. Harbough..... | 485 | 6" |
| Nov. 21, | Thornton, Milford North..... | 265 | 6" |
| Nov. 11, | Three Mile Drive, St. Paul South..... | 100 | 6" |
| | Three Mile Drive, St. Paul to Mack..... | 3,070 | 8" |
| | Three Mile Drive, Jefferson to Lakeside Drive..... | 1,204 | 6" |
| | Lakeside Drive, E. & W., Three Mile Drive..... | 593 | 6" |
| Jan. 22, | Vancouver, 628' W., Ironwood West..... | 153 | 8" |
| Nov. 6, | Torrey Ct., N. of Jackson..... | 254 | 6" |
| Nov. 11, | 12th, Lamothe North..... | 120 | 8" |
| Apr. 13, | Twelfth, Burlingame to Webb..... | 409 | 8" |
| | 12th, Elmhurst to Webb..... | 757 | 12" |
| | Elmhurst, 12th to Oakman..... | 639 | 12" |
| | Elmhurst, Oakman East..... | 652 | 8" |
| | Oakman, Elmhurst to Highland..... | 1,214 | 10" |
| | Oakman, Kendell to Highland..... | 3,938 | 8" |
| | Monterey, E. & W. Oakman..... | 1,272 | 6" |
| | Righton, E. & W. Oakman..... | 1,277 | 6" |
| | Cortland, E. & W. Oakman..... | 1,264 | 6" |
| | Highland, E. & W. Oakman..... | 1,304 | 8" |
| | Gray, E. & W. Oakman..... | 1,047 | 6" |
| | Leslie, E. & W. Oakman..... | 1,559 | 6" |
| | Glendale, E. & W. Oakman..... | 1,352 | 6" |
| | Tyler, E. & W. Oakman..... | 1,299 | 6" |
| | Waverley, E. & W. Oakman..... | 1,303 | 6" |
| | Davison, E. & W. Oakman..... | 1,312 | 8" |
| | Clements, E. & W. Oakman..... | 1,336 | 6" |
| | Grand, E. & W. Oakman..... | 1,320 | 6" |
| | Pasadena, E. & W. Oakman..... | 1,316 | 6" |
| | Ford, E. & W. Oakman..... | 1,323 | 6" |
| | Kendell, E. & W. Oakman..... | 1,310 | 6" |
| | LaBelle, E. & W. Oakman..... | 1,311 | 8" |
| | Buena Vista, Oakman East..... | 695 | 6" |
| | Buena Vista, Oakman West..... | 668 | 8" |
| | 12th, Buena Vista North..... | 243 | 8" |
| | Indiandale, 12th West..... | 241 | 6" |
| | Glendale, 12th West..... | 220 | 6" |
| | 12th, Glendale to Buena Vista..... | 287 | 6" |
| | Buena Vista, 12th West..... | 227 | 6" |
| Feb. 4, | Underwood, Gd. River West..... | 2,080 | 6" |
| Mar. 25, | Vancouver W., Ironwood West..... | 275 | 8" |
| Jan. 22, | Vancouver, 628' W., Ironwood West..... | 153 | 8" |
| July 13, | Vancouver, 450' W., Ironwood West..... | 180 | 8" |
| July 7, | VanDyke, Harper to N. VanDyke..... | 951 | 6" |
| | Hardyke, VanDyke East..... | 543 | 6" |
| | Malvern, VanDyke East..... | 449 | 6" b |
| Aug. 14, | Vicksburg, Linwood West..... | 382 | 8" |
| | A. S. Nicolet, Linwood East..... | 309 | 6" |

| | Feet | Size |
|--|-------|------|
| Aug. 25, Virginia, 12th West | 276 | 6" |
| July 6, Virginia Parks from 12th East..... | 668 | 6" |
| July 19, Wabash, Ferry Park to Blvd..... | 403 | 6" |
| May 6, Wagner, Mt. Elliott to Girardin..... | 2,877 | 8" |
| Nov. 26, Waldo E. Parkinson | 252 | 6" |
| May 22, Wellington, East Greeley | 12 | 6" |
| Oct. 26, Westminster, East Greeley | 238 | 12" |
| Oct. 19, Willard, Maxwell West..... | 79 | 6" |
| Maxwell, Willard North | 175 | 8" |
| July 28, Wilson, Bethune South | 201 | 8" |
| Jan. 4, Woodmere, Pearl East | 104 | 6" |
| May 20, Woodmere, Wendell to Phillips..... | | |
| Phillips, Woodmere South..... | 495 | 6" |
| July 11, Woodrow, 55' S., Moore Place N..... | 400 | 8" |

aVillage of Hamtramck; bTownship of Hamtramck; cVillage of Grosse Pointe Parks; dTownship of Grosse Pointe; eTownship of Greenfield; fVillage of Oakwood and gVillage of St. Clair Heights.

STORAGE YARD

The Storage Yard is the center of activities for all construction work on the distribution system, including storage and distribution of materials, supplies and equipment required in pipe laying work; repair of breaks or leaks; tapping mains for service connections; testing, setting and repairing meters, and all other work of a similar nature. All detailed accounting and bookkeeping pertaining to these various branches of the work also is done at the storage yard.

The accompanying tabulations show the character of the operations performed and the distribution of the costs.

Division of Storage Yard Labor

| | |
|--|-------------|
| Loading, unloading, storing and checking materials..... | \$ 9,905.16 |
| Cleaning, trimming and plugging salvaged pipe and special castings..... | 48.31 |
| Watching and care of yards, buildings and equipment..... | 5,639.19 |
| Caring for stables, wagons and harness..... | 3,010.25 |
| Night, Sunday and holiday emergency crews..... | 9,073.01 |
| Repairing and maintaining motor vehicles and other gasoline driven equipment | 2,791.57 |
| Repairing wagons and harness..... | 76.44 |
| Horseshoeing | 389.01 |
| Repairing and maintaining tools and equipment..... | 8,444.18 |
| Superintendence and clerical work..... | 14,223.28 |
| Special jobs | 766.68 |
| | <hr/> |
| | \$54,307.08 |

General Work, Year Ending June 30th, 1916

| | Material | Labor | Total |
|---|--------------------|--------------------|--------------------|
| Tapping mains and inserting 5,149 $\frac{5}{8}$ ", 1,663 $\frac{3}{4}$ ", 2,031 1", 13 $1\frac{1}{2}$ " and 13 2" service cocks and discontinuing 144 $\frac{5}{8}$ " and 41 1", also setting 90 2", 58 3", 30 4", 21 6" and 5 8" sleeves and valves for service..... | \$10,012.56 | \$ 5,990.86 | \$16,012.42 |
| Public drinking fountains set (3)..... | 94.45 | 70.14 | 164.59 |
| Examining, repairing and maintaining gates and wells | 3,670.60 | 2,726.11 | 6,396.71 |
| Repairing leaks and breaks in mains (132)..... | 872.06 | 2,449.11 | 3,321.17 |
| Attending to leaks on service connections (374)... | 462.86 | 1,442.50 | 1,905.36 |
| Responding to false reports of leaks (159)..... | 82.61 | 110.66 | 193.27 |
| Opening blow-offs to flush dead-ends..... | 296.29 | 2,036.33 | 2,332.62 |
| Shutting service connections on account of leaks and non-payment and letting on same..... | 84.73 | 196.27 | 281.00 |
| Examining fire plants, air chambers, hydraulic elevators, river connections, setting pressure gauges and reading pressures..... | 418.67 | 1,595.73 | 2,014.40 |
| Curing no water and short supply complaints.... | 172.24 | 545.67 | 717.91 |
| Repairing sunken trenches and damaged walks and lawns | 98.03 | 392.30 | 490.33 |
| Caring for drinking fountains..... | 195.92 | 756.63 | 952.55 |
| Setting hydrants—Billed Village of Ecorse..... | 83.28 | 18.18 | 101.46 |
| Laying 4" and 6" pipe in Riverside Park, foot of Morrell St.—Billed Dept. Parks and Blvds.... | 526.95 | 149.91 | 676.86 |
| Setting hydrants—Billed Village of Grosse Pointe Parks | 992.12 | 348.21 | 1,340.33 |
| Maintenance of Main Office building and equipment | 5.46 | 25.32 | 30.78 |
| Yard cartage and expressing to stores..... | 741.83 | 1,330.48 | 2,072.31 |
| Operation and maintenance of yards and buildings | 69.27 | 5,639.19 | 5,708.46 |
| Yard supplies and expense..... | 2.05 | ..... | 2.05 |
| | \$18,881.98 | \$25,832.60 | \$44,714.58 |

SERVICES AND METERS

New service taps to the number of 9,082 were made during the year and 185 old taps were removed, making a net increase of 8,897, and giving a total of 132,030 service connections of all sizes in the system. The taps made during the year, and the total number in use at the close of the fiscal year were as follows:

| Size | Installed | Removed | Net Increase | Total in System |
|--------------------------------------|-------------|------------|--------------|-----------------|
| $\frac{5}{8}$ " Service Cocks | 5149 | 144 | 5005 | 92061 |
| $\frac{3}{4}$ " Service Cocks | 1663 | | 1663 | 2077 |
| 1" Service Cocks | 2031 | 41 | 1990 | 35082 |
| $1\frac{1}{2}$ " Service Cocks | 13 | | 13 | 13 |
| 2" Service Cocks | 13 | | 13 | 13 |
| 2" Sleeve and Valve..... | 99 | | 99 | 1365 |
| 3" Sleeve and Valve..... | 58 | | 58 | 765 |
| 4" Sleeve and Valve..... | 30 | | 30 | 430 |
| 6" Sleeve and Valve..... | 21 | | 21 | 203 |
| 8" Sleeve and Valve..... | 5 | | 5 | 18 |
| 10" Sleeve and Valve..... | | | | 2 |
| 12" Sleeve and Valve..... | | | | 1 |
| Totals | 9082 | 185 | 8897 | 132030 |

The $\frac{3}{4}$ -inch, first introduced here last year, is being more generally used. The use of $1\frac{1}{2}$ -inch taps on mains six inches in diameter and larger, and of 2-inch taps on mains eight inches in diameter and larger was inaugurated this year.

All new service connections were metered and in addition about 9,000 old services were equipped with meters. A total of 21,364 new meters were set, and 3,553 were removed, making a net increase of 17,811 meters, and a total of 46,991 meters in service.

All meters are carefully tested before being set, and other meters in service are tested occasionally. The following tables give in detail the number of meters of all sizes set during the year, and the total number in service; the cost of testing meters, and the cost of installing meters. The figures of average cost of installing meters include the full cost of the meter.

Number of Meters Set, Year Ending June 30th, 1916

| | $\frac{5}{8}$ " | $\frac{3}{4}$ " | 1" | $1\frac{1}{2}$ " | 2" | 3" | 4" | 6" | 8" | 10" | 16" | Ind. | Total |
|-------------------------------------|-----------------|-----------------|------|------------------|-----|-----|-----|-----|----|-----|-----|------|-------|
| In service July 1, 1915..... | 16258 | 8114 | 2809 | 722 | 679 | 271 | 194 | 97 | 5 | 1 | 1 | 29 | 29190 |
| Set during year ending | | | | | | | | | | | | | |
| June 30, 1916..... | 14055 | 5955 | 1119 | 95 | 97 | 23 | 16 | 4 | .. | .. | .. | .. | 21364 |
| Total | 30313 | 14069 | 3928 | 817 | 776 | 294 | 210 | 101 | 5 | 1 | 1 | 29 | 50544 |
| Removed during year ending | | | | | | | | | | | | | |
| June 30, 1916..... | 2083 | 1057 | 362 | 21 | 24 | 2 | 2 | 1 | .. | .. | .. | 1 | 3553 |
| Net gain | 11972 | 4898 | 757 | 74 | 73 | 21 | 14 | 3 | .. | .. | .. | 1 | 17811 |
| Total in service July 1, 1916 | 28230 | 13012 | 3566 | 796 | 752 | 292 | 208 | 100 | 5 | 1 | 1 | 28 | 46991 |

Cost of Installing Meters, Year Ending June 30, 1916

| Size | Number | Labor and Cartage | Material | Total | Ave. Labor and Cartage | Ave. Material | Ave. Cost |
|------------------|---|-------------------|-------------|-------------|------------------------|---------------|-----------|
| $\frac{5}{8}$ " | (8072 (4.20)
(3900 (5.10)
(2069 (6.50) | \$2,753.56 | \$53,792.40 | \$56,545.96 | \$0.23 | \$ 4.49 | \$ 4.72 |
| $\frac{3}{4}$ " | (2829 (7.30)
(706 (9.30) | 1,126.54 | 34,100.20 | 35,226.74 | .23 | 6.96 | 7.19 |
| 1" | (51 (9.12) | 174.11 | 7,030.92 | 7,205.03 | .23 | 9.29 | 9.58 |
| $1\frac{1}{2}$ " | (74 (21.00)
(47 (35.00) | 103.23 | 1,554.00 | 1,657.23 | 1.40 | 21.00 | 22.40 |
| 2" | (26 (32.50) | 101.84 | 2,490.00 | 2,591.84 | 1.40 | 34.11 | 35.50 |
| *3" | 21 | | | | | (30.00) | 60.00 |
| *4" | 14 | | | | | 120.00 | 120.00 |
| *6" | 3 | | | | | 250.00 | 250.00 |

*Set by consumer.

Cost of Meter Testing, Year Ending June 30th, 1916

| Sizes | Number | Flows | Cost | Average |
|--------|--------|--------------|------------|------------|
| 5/8" | 11,505 | Full to 1/8" | \$ 977.99 | \$.08 1/2 |
| 3/4" | 5,650 | " " 1/8" | 480.28 | .08 1/2 |
| 1" | 750 | " " 1/8" | 105.12 | .14 |
| 1 1/2" | 114 | " " 1/8" | 53.60 | .47 |
| 2" | 102 | " " 1/8" | 47.98 | .47 |
| 3" | 21 | " " 1/8" | 44.18 | 2.10 |
| 4" | 13 | " " 1/8" | 27.36 | 2.10 |
| 6" | 6 | " " 1/8" | 12.62 | 2.10 |
| | 18,161 | | \$1,749.13 | |

Kind of Meters in Service, Year Ending June 30th, 1916

| | 5/8" | 3/4" | 1" | 1 1/2" | 2" | 3" | 4" | 6" | 8" | 10" | 16" | Ind. | Total |
|------------------------|---------|--------|-------|--------|-----|-----|-----|-----|----|-----|-----|------|--------|
| Crown | | | 3 | | | | | | | | | | 3 |
| Hersey Rotary | | | 7 | 2 | 1 | | | | | | | | 10 |
| Hersey Detector | | | | | | 1 | 8 | 19 | 5 | 1 | | | 34 |
| Hersey Disc F. 11 | | 5 | 2 | | | | | | | | | | 18 |
| Hersey Disc D. 13 | | 3 | | 12 | 15 | 5 | 7 | 1 | | | | | 36 |
| Hersey Torrent. | | | | | | 5 | 3 | 3 | | | | | 11 |
| Hersey Worth | | | | | | | | | | | | | |
| Pist. | | 1 | 2 | | 1 | 1 | | | | | | | 5 |
| American | 36 | 11 | 7 | 6 | 2 | | | | | | | | 62 |
| Keystone | 29 | 8 | 5 | 3 | 2 | | 2 | | | | | | 49 |
| King | 32 | 9 | 3 | 2 | 3 | | | | | | | | 49 |
| 1912 | | | | | | | | | | | | | |
| Watch-Dog, con. | 1,883* | 206 | 83 | 36 | 71 | | | | | | | | 2,279 |
| 1916 | | | | | | | | | | | | | |
| Watch-Dog, con. | 7,165** | 1,601 | | | | | | | | | | | 8,766 |
| Worthington | 6,165 | 3,269 | 1,028 | 131 | 130 | 58 | 54 | 34 | | | | | 10,869 |
| Thomson | 4,527 | 1,628 | 1,452 | 485 | 457 | 195 | 118 | 42 | | | | | 8,904 |
| Nash | 8,309 | 6,271 | 973 | 119 | 69 | 27 | 14 | | | | | | 15,842 |
| Nilo | | | | | 1 | | 1 | | | | | | 2 |
| Eureka | | | | | | | 1 | 1 | | | | | 2 |
| Indicator | | | | | | | | | | | | 28 | 28 |
| Neptune | | | 1 | | | | | | | | | | 1 |
| Crest Trident... | | | | | | | | | | | 1 | | 1 |
| | 28,230 | 13,012 | 3,500 | 796 | 752 | 292 | 208 | 100 | 5 | 1 | 1 | 28 | 46,991 |

*235 rev.

**300 rev.

PUMPING STATION AND GROUNDS

The work of laying out new walks and roadways in the grounds of the new Pumping Station was continued intermittently during the year, and an endeavor made to improve the grounds generally, the work being hampered by the construction of connections to the 48 inch Jefferson Avenue main.

The Chlorination House which was started the latter part of the previous year, was completed, and the liquid chlorine treatment started on partial service in January, 1916, and in full service in March, 1916.

The work on the four Screen Houses was started early in

the year, but the cleaning of the basin caused an interruption to this work, and delayed operations sufficiently to prevent their completion. Several of the screens are in place, so that no interference will be caused to the supply from the basin to the water galleries.

An eight foot diameter brick tunnel to connect the ten foot tunnel with the water gallery of the new Pumping Station was commenced in March, 1915, and work on this structure had to be discontinued on account of the cleaning of the settling basin. Upon completion of the latter, the work was resumed, and the tunnel and connections finished, and placed in service in February, 1916.

The work of cleaning the settling basin was started in July, 1915, and was completed early in November, 1915. In addition to removing the deposit of sediment which has accumulated over a period of nearly forty years, it was necessary to remove a large timber and stone baffle or bulkhead at the southerly end, and to repair and lower some of the intakes and outlets, and construct new ice shields. Approximately 40,000 cubic yards of mud was removed, the depth of the basin being thereby increased three and one-half feet.

Accumulations of ice in the ports of the Intake Crib caused a shortage of water through the 10 ft. tunnel on three occasions in January, 1916. A study of conditions at the Crib disclosed the fact that the two 5 feet ports, which have the perforated steam pipes around the outer edge, were equipped with heavy cast iron hinged gates which apparently had never been opened. These gates were raised and chained open, and a permanent connection made to the steam pipe to facilitate turning steam into these ports from the fire boat.

NEW AND PROPOSED WORK

Intake Crib Fender

With a view to eliminating or minimizing the danger of interruption to the water supply to the intake tunnel the recommendation is made for the construction of a V-shaped timber fender at the up-stream end of the Intake Crib, as a diverter for ice and other floating material, and the removal of all the slated gratings from the four foot diameter ports of the Crib, on the theory that this fender will create a body of partially still water around the intake ports, and the removal of

the gratings will decrease the tendency of needle ice to build up an obstruction at these points.

Pumping Engines

The rapid increase in population of Detroit, with the resultant increase in water consumption makes it imperative that additional pumpage facilities be considered, and with this in view I recommend that specifications be prepared and proposals requested on two new pumping engines having a capacity of approximately 37,000,000 gallons each. Pumping engines of this capacity will be practically counterparts of the present engines in the new station with a slight increase in diameters of the steam cylinders and the pump plungers. As the normal maximum capacity of a 48-inch main would be about 37,000,000 gallons, it would seem advisable to have pumping units of this capacity, rather than smaller. I also recommend the construction of a boiler house back of the new Pumping Station, having a capacity for six, six-hundred horse power boilers, and having one stack about ten feet in diameter and 225 or 250 feet high, the station to be equipped with overhead coal bunkers, having a capacity of approximately five hundred tons of coal, or a week's supply, and to be fed by conveyors from the coal storage sheds back of the old Pumping Station.

Additional Coal Storage

The necessity for additional coal storage capacity is apparent, as the present capacity of about 12,000 tons is just adequate to carry over the season of closed navigation and leaves a margin of less than one month's supply on hand in the spring. This is too close a margin for safety as a coal strike or railroad strike might interfere with early deliveries after navigation opens.

For this reason I recommend the construction of an additional section to the coal sheds back of the old Pumping Station, about 90 feet wide, which would add nearly 50 per cent. or about 6,000 tons to the present storage capacity.

Settling Basin

In order to eliminate the danger of local pollution to the water supply, I would recommend that the bottom and sides of the present settling basin be concreted, and means provided

for cleaning it out readily. The bottom should be constructed so as to provide for a series of columns for supporting a concrete roof and the basin could either be covered now or at some future time. This basin after being covered, would constitute the clear water basin of any filtration plant which may be installed in the future. If covered now, the roof could be covered with dirt and sodded, forming an additional section of park area.

New Distributing Mains

With a view to providing for the normal increase in consumption on the high service system, I recommend that steps be taken to extend the 48-inch main on Garland Avenue northward to Gratiot Avenue and French Road to Lynch Road, and thence northwestwardly on Lynch Road, Mt. Elliott Avenue, Bloom Road, Conant Road and Six Mile Road to Log Cabin Avenue, and from there south with a 42-inch main to connect with the 36-inch main projected on Twelfth Street. Also to construct a 42-inch main on Dequindre Street, connecting the present 42-inch main on Holbrook, with the proposed 48-inch main at the Six Mile Road.

These large mains, if constructed as suggested, will provide an ample supply for the section embraced, and will permit of the further extension of a 42-inch main west of Twelfth Street to connect eventually with Grand River Avenue at or near the present westerly boundary of the city. Intermediate mains of moderate size, cross connecting with present main arteries will form a basis for the extension of all small mains in contiguous territory.

The difficulty of securing sufficient labor is becoming more apparent each month, and to offset this handicap, it is proposed to substitute machinery in every instance where it is possible to do so to advantage.

GENERAL

Attention is called to a table of statistics, appended hereto, in form recommended by the New England Water Works Association, giving a concise statement of the principal data regarding the Water Works System and its operation.

In closing the record of the year's operations, I desire to express my appreciation for the support and co-operation which I have received from the President, and members of the Board, and from the officers and employes of the Board in all matters affecting the welfare of the Water Works.

Very respectfully,

THEODORE A. LEISEN,
General Superintendent.

SUMMARY of STATISTICS

In form recommended by the New England Water Works Association.

Detroit Water Works,
Detroit, Wayne County, Michigan.

GENERAL STATISTICS.

Population by United States Census of 1910, 465,766.

Date of construction, 1827.

By whom owned. The Board of Water Commissioners of the City of Detroit.

Source of supply, Detroit River, near Lake St. Clair.

Mode of supply, pumping.

PUMPING STATISTICS.

Builders of pumping machinery—

- One 24,000,000 gallon, Compound Beam, Detroit Locomotive Works, Detroit, Michigan.
- One 24,000,000 gallon, Compound Beam, Riverside Engine Works, Detroit, Michigan.
- One 30,000,000 gallon, Compound Beam, Riverside Engine Works, Detroit, Michigan.
- One 24,000,000 gallon, Triple Expansion, E. P. Allis & Co., Milwaukee, Wis.
- Two 25,000,000 gallon, Triple Expansion, Allis Chalmers Co., Milwaukee, Wis.
- One 25,000,000 gallon, Triple Expansion, Holly Mfg. Co., Buffalo, N. Y.
- Three 30,000,000 gallon, Triple Expansion, Bethlehem Steel Co., South Bethlehem, Pa.

Description of fuel used—

- a. Kind, bituminous, run of mine.
- b. Brand of coal, Meadowbrook, W. Va.
- c. Average price of coal, per gross ton (2,240 lbs.) delivered at Water Works\$2.48
- d. Percentage of ash, from Laboratory Analyses.....7.8%
- e. Wood, price per cord, none used.

Coal consumed for the year, 50,154,000 lbs.

Amount of other fuel used, none.

Total pumping for the year—

| | |
|--------------------|------------------------|
| High Service | 12,868,275,000 gallons |
| Low Service | 33,820,674,000 gallons |
| Total | 46,688,949,000 gallons |

An allowance of 3% slip for all engines has been made in these quantities, and they represent the actual metered consumption.

Average static head against which pumps work—

| | |
|--------------------|----------------------|
| High Service | 65.7 lbs., 151.8 ft. |
| Low Service | 47.5 lbs., 109.7 ft. |
| Whole System | 52.5 lbs., 121.3 ft. |

Number of gallons pumped per pound of equivalent coal, 931.

$$\text{Duty} = \frac{\text{Gallons pumped} \times 8.34 \text{ (lbs.)} \times 100 \times \text{dynamic head}}{\text{Total Fuel Consumed.}} = 94,200,000$$

Cost of pumping, figured on pumping station expenses, \$137,612.22.

Per million gallons pumped, \$2.94.

Per million raised one foot (dynamic), \$0.024.

STATISTICS OF CONSUMPTION OF WATER.

| | |
|--|------------------------|
| Estimated total population at date (City of Detroit)..... | 734,562 |
| Estimated population on lines of pipes..... | 781,133 |
| Estimated population supplied..... | 781,133 |
| Total consumption for the year..... | 46,688,949,000 gallons |
| Passed through meters | 24,632,230,000 gallons |
| Percentage of consumption metered..... | 52.7% |
| Average daily consumption | 127,565,434 gallons |
| Gallons per day to each inhabitant..... | 163.3 |
| Gallons per day to each consumer..... | 163.3 |
| Gallons per day to each tap..... | 966 |
| Cost of supplying water, per million gallons, figured on total maintenance | \$7.22 |
| Total cost of supplying water, per million gallons, figured on total maintenance plus interest on bonds..... | \$8.78 |

STATISTICS RELATING TO DISTRIBUTION SYSTEM.

MAINS.

| | |
|--|-------------------------------|
| Kind of pipe, cast iron. | |
| Sizes, from 2-inch to 48-inch. | |
| Extended during year | 259,671 feet 49.18 miles |
| Discontinued during year | 5,044 feet .95 miles |
| Total now in use | 5,305,557 feet 1,004.84 miles |
| Cost of repairs per mile..... | \$3.31 |
| Number of leaks per mile..... | 0.13 |
| Length of pipes less than 4 inches diameter..... | 10.22 miles |
| Number of hydrants (public) added during the year..... | 313 |
| Number of hydrants (public) now in use..... | 7,064 and 193 H. P. |
| Number of cisterns now in use..... | 517 |
| Capacity of cisterns | 3,780,000 gallons |
| Number of stop gates added during the year..... | 502 |
| Number of stop gates now in use..... | 11,069 |
| Number of blow-offs | 838 |
| Number of stop gates smaller than 4 inch..... | 27 |
| Range of pressure on mains, 16 lbs. to 66 lbs. | |

SERVICES.

| | |
|---|---------|
| Kind of pipe, lead and cast iron. | |
| Sizes, $\frac{5}{8}$ -inch to 12-inch. | |
| Number of service taps added during year..... | 9,083 |
| Number now in use | 132,030 |
| Average length of service, approximately 30 feet. | |
| Number of meters added..... | 21,364 |
| Number now in use | 46,991 |
| Percentage of services metered..... | 35.6% |
| Percentage of receipts from metered water..... | 56.0% |

FINANCIAL STATISTICS.

RECEIPTS.

| | | |
|------------------------------|--------------|-------------------|
| Assessment rates | \$615,034.31 | |
| Meter rates | 784,126.45 | |
| Delinquent, etc. | 8,605.71 | |
| Total from consumers | | \$ 1,407,766.47 |
| Miscellaneous receipts | \$149,734.82 | |
| Interest | 17,767.39 | |
| | | <u>167,502.21</u> |
| | | \$1,575,268.68 |

EXPENDITURES.

| | | |
|---|-----------------|----------------------|
| Water Works Maintenance— | | |
| Operation, management and repairs..... | \$336,857.63 | |
| Interest on bonds | 72,845.00 | |
| | | <u>\$409,702.63</u> |
| Depreciation account | 146,785.96 | |
| | | <u>\$ 556,488.59</u> |
| Balance | | \$ 1,018,780.09 |
| Disposition of balance, devoted to construction work— | | |
| Valuation of works | \$12,859,714.19 | |
| Value of real estate..... | 863,128.43 | |
| Bonded debt | 1,947,000.00 | |
| Amount of Sinking Fund | 100,115.58 | |
| Average rate of interest | | $3\frac{1}{2}\%$ |

